TM 3-205

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

THE GAS MASK

DEPARTMENT OF THE ARMY • *MARCH 1951*

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Jack E. Phillips

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DEPARTMENT OF THE ARMY
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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. This manual is published for the information and guidance of the using branches and for personnel charged with the issue, fitting, and organizational (1st and 2d echelon) maintenance and repair of gas masks.

b. In addition to a list of all authorized masks and descriptions of major components of the various types of masks, this manual includes information on inspection, testing, care, and maintenance of gas masks and their components, as well as information on gas mask accessories. Packing and packaging of complete gas mask assemblies are covered in appendix II.

2. Arrangement

a. The general discussion in this chapter, of gas masks and the general description of the three major components of any mask (facepiece, canister, and carrier) are followed in chapter 2 by a description of all authorized complete gas mask assemblies. The standard mask assemblies shown in table I are described in order. Table I should be used for ready reference and for a complete listing of authorized gas mask assemblies and their components.

b. The discussion of authorized gas mask assemblies is followed, in chapter 3, by detailed descriptions of standard facepiece assemblies and their components, canisters and their components, and carriers and their components.

c. Since chapters 2 and 3 are intended as reference material, a complete description is given of each gas mask assembly, as well as of each facepiece assembly, canister, and carrier, except that

cross references are used for like parts. The major differences between models of facepieces, canisters, and carriers are pointed out for each series of models in the paragraph dealing with that series. Differences between complete gas mask assemblies may be determined by consulting table I.

d. Table I lists the components making up each assembly, with brief information about each. This table also enables a comparison to be made of any two or more authorized mask assemblies.

Section II. CHARACTERISTICS COMMON TO ALL GAS MASKS

3. General

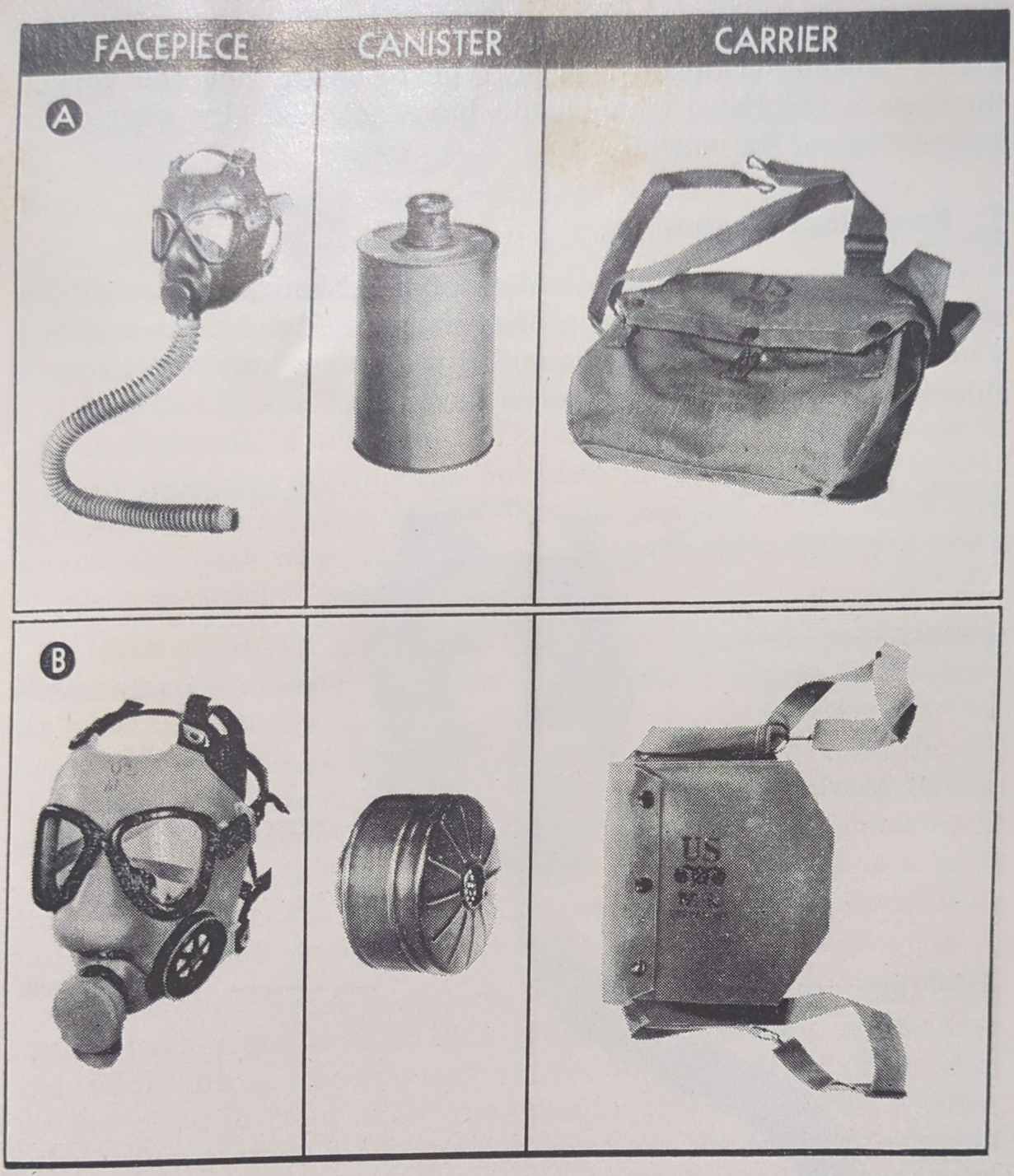
a. Essentially, the gas mask is a cover or shelter against harmful substances in the air, just as a roof and walls are a shelter against the elements. To serve as a shelter, the mask contains an air filter which protects the face, eyes, and respiratory tract from war gases and toxic solid and liquid particles that may be suspended in the air. Air is drawn into the mask when the wearer inhales, and the mask is so constructed that this air must first pass through a canister containing a filtration system. This system is made up of a mechanical filter and a chemical filling, the mechanical filter clearing the air of solid and liquid particles, and the chemical filling adsorbing and/or neutralizing toxic and irritating gases and vapors. After being purified, the air is drawn to the wearer's face where it is inhaled. Exhaled air is expelled from the mask through an outlet valve, which is so constructed that it opens only to let exhaled air escape.

b. Each gas mask assembly consists of three major components—facepiece assembly, canister, and carrier (fig. 1), which are discussed in paragraphs 5, 6, and 7. Some gas masks have the canister attached to a hose; other masks have the canister attached directly to the facepiece. In either case, major components of the mask are the same.

c. Information in this section is concerned primarily with military type gas masks and not necessarily with special gas masks.

4. Development

The first gas masks (used during World War I as protection against German chlorine attacks) were cotton cloth pads soaked in neutralizing chemicals and tied about the mouth and nose. Later, tear gas attacks forced the development of a hood-type mask with eyepieces, but the neutralizing chemicals with which the cloth materials were soaked still provided the only protection.



A. Lightweight service gas masks M3A1–10A1–6 (canister connected to facepiece by hose).

B. Gas mask M9 (canister connected directly to facepiece).

Figure 1. Major components of gas masks.

As concentrations of war gases increased, it was found necessary to filter air through more efficient adsorbing and neutralizing devices than chemically impregnated cloth. Consequently, the canister containing charcoal, soda lime, and potassium permanganate was developed, together with a facepiece which covered the face, and a hose connection between canister and facepiece. Most of these early developments included a nose clip, to prevent breathing through the nose, and a rubber mouthpiece to insure that only air from the canister reached the respiratory passages. The canister was carried in a cloth bag, or slung by a strap over

the shoulder. The modern mask is a refinement of the World War I facepiece-canister-carrier type of mask, but the various changes in the three components have not basically altered the composition of the mask itself.

5. Facepiece Assembly

The facepiece assembly consists of faceblank, tab assemblies, eyepieces, outlet valve, and a head harness (fig. 2). In addition, a nose-cup and a canister mounting piece or a hose are also considered as component parts of a facepiece.

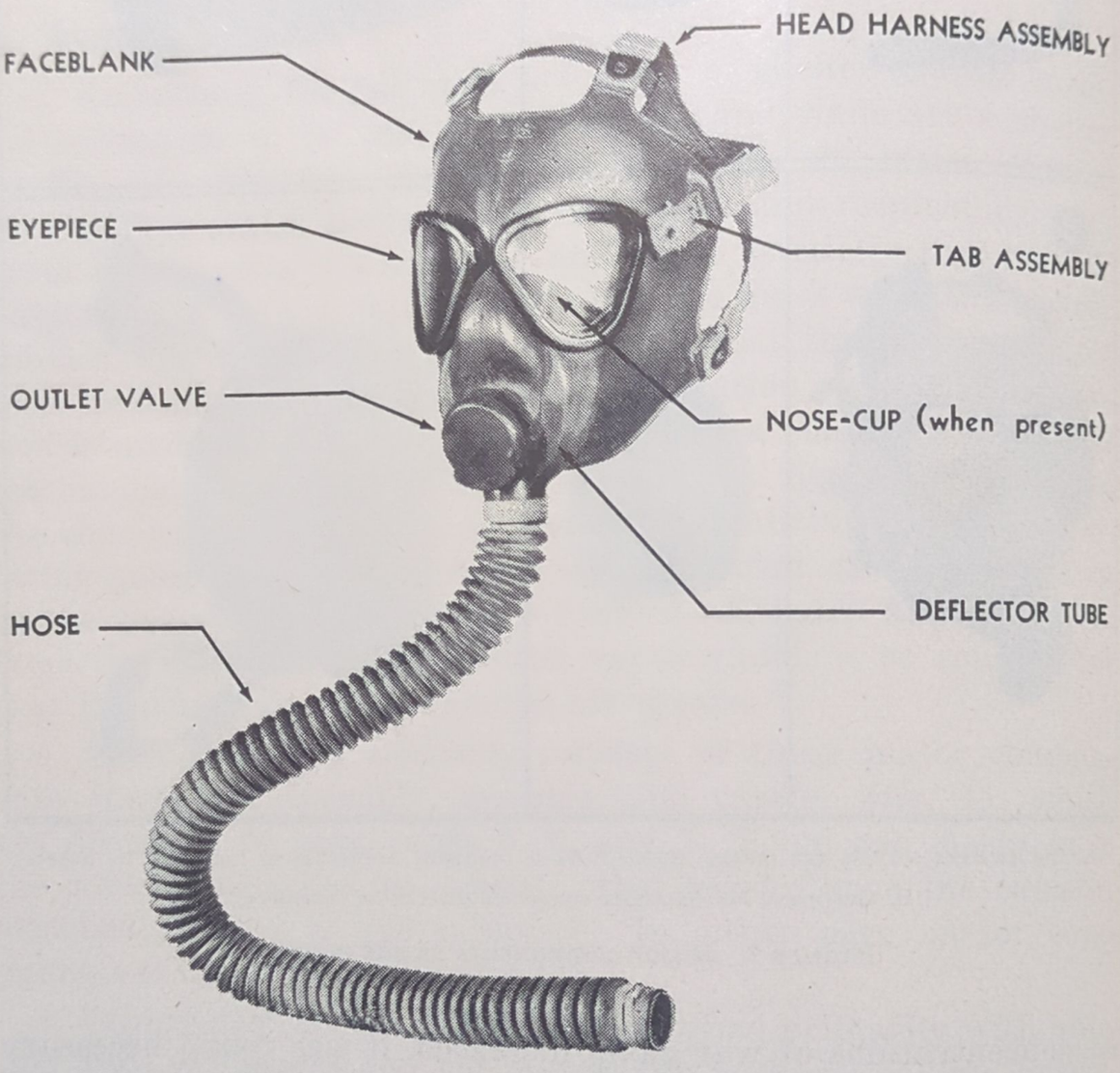


Figure 2. Facepiece assembly.

a. FACEBLANK. Faceblanks, made of molded rubber, are either black or gray. Black faceblanks are made of reclaimed rubber, reprocessed rubber, or synthetic rubber; gray faceblanks are made of natural rubber. Each faceblank is provided with an outlet valve nozzle opposite the mouth of the wearer. A hose stem is molded into the chin section or, in some types, a flanged hole on either the right or left cheek receives the canister mounting piece

assembly. Openings are provided in the faceblank for eyepieces so that lenses can be inserted and eyerings crimped into place. Molded attachments for the tab assemblies are on the sides of the faceblank at cheek, temple, and forehead positions. Deflector tubes, which cause incoming air to flow over the lenses to help prevent fogging, are integrally molded into the faceblank.

b. EYEPIECES. Eyepieces usually consist of lenses and metal eyerings. Lenses (made of transparent plastic material, laminated glass, or high-grade plate glass) fit inside the sockets in the faceblanks. The eyerings, which are crimped to the rubber surrounding the lenses, hold the lenses in place.

c. OUTLET VALVE ASSEMBLY. The outlet valve assembly acts as a check valve, permitting the outward flow of air when wearer of the gas mask exhales, but preventing passage of contaminated air into the mask when the wearer inhales. Several different types of valves are used.

d. HEAD HARNESS ASSEMBLY. The head harness, consisting of straps of elastic webbing, holds the facepiece firmly in place on the head. Straps are attached at each end to the facepiece by tab assemblies, which are riveted to the facepiece. Buckles on the tab assemblies facilitate adjustment of the mask to fit the wearer and allow easy replacement of the head harness. If the canister is attached directly to the facepiece, the head harness has a neck strap to overcome the tendency of the canister to swing (pendulum action) or to pull the mask away from the wearer's face.

e. NOSE-CUP. Some facepieces contain a nose-cup. This is a molded rubber piece which divides the air space between the face and the faceblank into two compartments, one in front of the eyes and the other in front of the nose and mouth. It contains a check valve which permits air to move freely from the eye compartment to the nose compartment, but impedes air movement in the reverse direction. Thus, the nose-cup prevents exhaled air from contacting the eyepieces and fogging them by condensation of moisture.

f. CANISTER MOUNTING PIECE AND HOSE. One or the other of these component parts is used to connect the facepiece assembly to the canister.

6. Canister

a. GENERAL. The canister of the gas mask is the air purifying device. The body of the canister incloses a mechanical filter and a container holding a chemical filling. Figure 3 shows one type of canister.

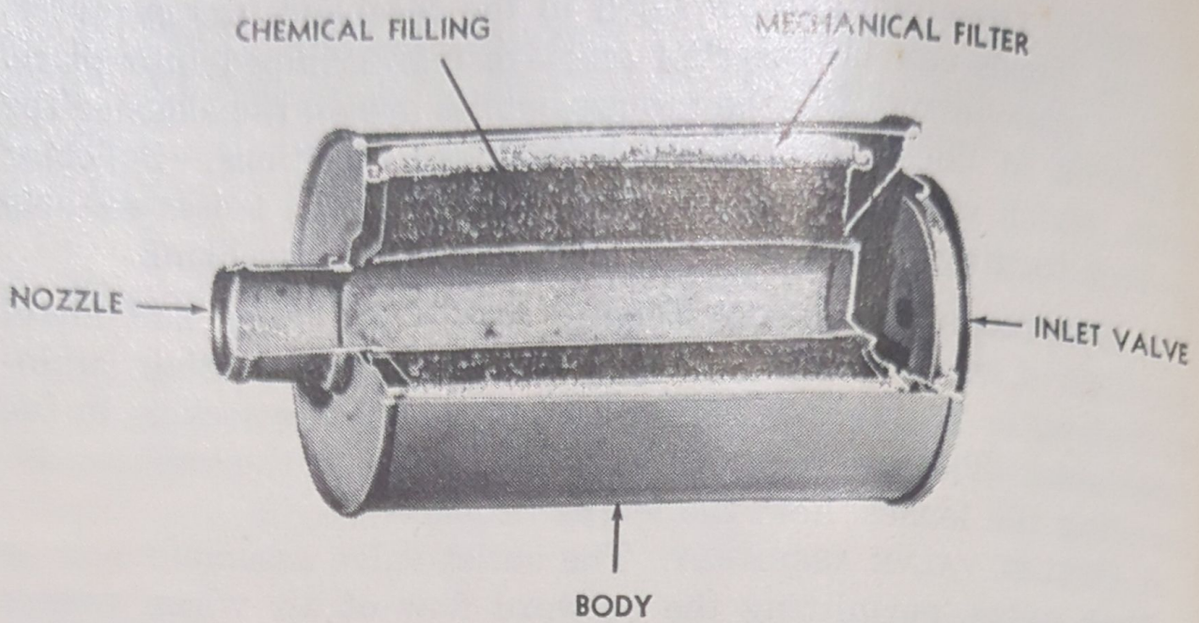


Figure 3. Canister.

(1) Some gas mask models have a canister which remains in the gas mask carrier even when the mask is worn. A hose connects the canister outlet nozzle with the hose stem of the facepiece. These canisters, which are either cylindrical or rectangular, are provided with a rubber disk inlet valve at the end where air enters the canister. This valve acts as a check valve, permitting air to travel into the canister when the wearer inhales but preventing the flow of air back through the canister when the wearer exhales.

(2) Other canisters are attached directly to the facepiece and require no hose. With such canisters, the inlet valve is not a part of the canister assembly but is located in the canister mounting piece or adapter. Canisters may be identified by the model number stamped or stenciled on the surface.

b. COMPONENTS.

(1) *Body.* The metal body houses the air purifier. The parts are so constructed that air flows through the mechanical filter and then through the chemical filling. In most canisters, the air flows radially through the purifying materials. After passing through the inlet valve in the bottom of the canister to a baffle plate which forces it to the sides, it passes up the sides. It then flows through the mechanical filter and the chemical filling to the central axis of the canister. In some canisters, air flows axially; that is, directly through the mechanical filter after entering the inlet opening, then through the chemical filling and to the inlet valve without a change of direction.

(2) *Mechanical filter.* The mechanical filter is made of special materials with interstices fine enough to stop the extremely small solid and liquid particles (in the form of aerosols) of which irritant gases and smokes consist. Most of these particles cannot be seen under an ordinary high-power microscope since they are of minute (colloidal) dimensions. Even under the ultramicroscope, they are visible only as points of reflected light. Although the material used for the mechanical filter must be able to stop these minute particles, the filter must not be so dense as to cause a high resistance to the flow of air through it and thus cause increased breathing resistance. The canister contains a filter fulfilling these requirements. In most canisters, the mechanical filter is a flat sheet wrapped about the wall which restrains the chemical filling; in others, it is a fluted or folded sheet inserted into the canister between the inlet opening and the chemical filling. Canisters with filters will protect against insectides, miticides, rodenticides, and fungicides sprayed or used as aerosol dusts.

(3) *Chemical filling.* Contaminated air, after passing through the mechanical filter, is drawn through the chemical filling, which takes toxic and irritant gases and vapors from the air mostly by the process called adsorption. Adsorption is the condensation or adhesion of a gas, solid, or liquid in a thin layer on the surface of any solid with which it comes in contact. This action may be considered comparable to that of iron filings being attracted to and remaining on a magnet. Since charcoal is probably the most powerful adsorbent known, it becomes a logical choice for the chemical filling of the canister. In actual fact, the charcoal used for gas masks is subjected to special processes and treatments which make it an even more powerful adsorbent. Under treatment, it becomes ultraporous carbon and is called activated (impregnated) charcoal. Activated charcoal has enormous adsorptive surface in relation to its volume, because it contains many tiny capillary pores. Within these pores, the molecules of gases are brought well within the range of molecular attractive forces, and are adsorbed or neutralized. The layer or bed of activated charcoal is held in the body of the canister by a perforated tube or screen and by cotton batting or netting, through which the air passes on its way to the facepiece.

(*a*) *Theory of adsorption.* One of the important factors which determines the amount of adsorption on the surface of a solid is the amount of surface exposed. (Temperature and pressure of the adsorbed substance are other factors. Humidity is important insofar as water may reduce the amount of exposed area.) A cube 1 centimeter on edge has an external surface of 6 square centimeters. If it is subdivided into smaller cubes, each only 100 millimicrons on edge, the total exposed surface becomes 600,000 square centimeters (1 centimeter equals 10 million millimicrons). If the material is further subdivided into particles 10 millimicrons on edge (into the colloidal realm), the total surface becomes 6,000,000 square centimeters. This vast increase of surface magnifies all surface influences. A solid has, in all three dimensions, a latticelike structure and its surface is like a checkerboard with atoms arranged in orderly fashion. Each atom at the surface has unsatisfied forces (free valences) which are available for attaching one molecule of the gas being adsorbed. There is a continuous movement of molecules from the gas toward the adsorptive surface and in the opposite direction. The rate at which the gas molecules are adsorbed depends upon three factors: the number striking the surface per second (this depends upon the concentration of the gas), the number of vacant spaces on the surface, and the tendency for the particular gas to condense to a liquid. The higher the liquefying point of a gas or vapor, the more easily it is adsorbed. Thus, mustard gas vapor is adsorbed more readily than hydrogen cyanide or even phosgene.

(*b*) *Activated (impregnated) charcoal.* Charcoal is usually made from wood or woodlike materials. These consist of cellulose and other constituents. In charcoal manufacture, the cellulose is heated and thus converted to carbon while water and some other constituents are evolved. The residue is called primary charcoal. When primary charcoal is subjected to treatment with heat and steam, more of the constituents are driven off, leaving purer carbon. This activated charcoal is full of tiny spaces which were formerly occupied by the materials driven off by the treating processes. The resultant has an extremely great surface area for the small amount of charcoal. Charcoal may also be proc-

essed in part by chemical action, and may be subjected to further special treatments by certain chemicals to increase its adsorptive and neutralizing power for certain war gases.

c. LIMITATIONS.

(1) *Limitations common to all canisters.*

(*a*) *Oxygen deficiency.* Gas mask canisters only purify air; they do not manufacture oxygen. Therefore, when air is deficient in oxygen, no canister is effective in supplying air suitable for breathing. This oxygen deficiency is often found in mines after an explosion, in the holds of ships, in oil tanks, or in inclosed places during fires. When work under such conditions is necessary, a commercial apparatus to supply oxygen must be used.

(*b*) *Use against DDT.* When using canisters to protect against DDT solvents, penetration of a slight odor warns of the need for canister replacement. An arbitrary limitation has been established, however, whereby any canister used against DDT for more than 2 days is not considered fit for subsequent service against war gases. Adherence to the protective procedures set forth in FM 21–40 affords the best assurance of preventing gas casualties.

(2) *Limitations peculiar to military type (war gas) canisters.*

(*a*) *Effectiveness.* Military canisters are for general issue and are effective against known war gases and smokes. These canisters, however, are not for fire fighting, nor do they protect against carbon monoxide gas which is often present in manufactured fuel gases and automotive exhaust gas, and frequently results from fires burning in inclosed places. Military canisters do not protect against ammonia gas, frequently encountered around refrigeration plants. Military type canisters are designed for concentrations of war gases not greater than 1 percent by volume; they do not offer adequate protection against the higher concentrations of war gases likely to be encountered in inclosed places. Personnel are not apt to encounter higher concentrations in the field unless they are very close to a shell or bomb burst, or are changing a valve or repairing a leak in a chemical container. Extremely high concentrations are of short duration in the open.

(*b*) *Life of canister.* The actual life of any individual canister varies with the type and concentration of the

chemical agent in the air, the number of minutes of exposure to this concentration, and the rate of breathing of the wearer. Temperature and humidity also affect the life of a canister. A change in any one factor affects the life of the canister, since it can hold only a definite weight of a given war gas under given conditions.

(c) *Signs of break-down.* The military canister rarely breaks down suddenly. It usually fails gradually, warning the wearer that replacement is needed by causing minor sensatory effects, such as a persistent slight odor of gas or persistent lacrimation.

(3) *Limitations peculiar to special purpose canisters.* Special purpose canisters, as components of special masks, are designed for specific use. With the exception of the HCN and all-purpose canisters, special purpose canisters do not protect against war gases and smokes; even the HCN and all-purpose canisters should not be used where the toxic gas concentration exceeds 1 percent by volume. (The all-purpose canister does not give adequate protection against irritant smokes.)

7. Carrier

a. GENERAL. Every gas mask is equipped with a carrier, inside of which the facepiece assembly and canister are carried when the mask is not in use (fig. 4). The carrier is held in place on the body of the wearer by adjustable shoulder and body straps. Carriers are made either of waterproofed duck or rubberized fabric; they vary in structure and detail.

b. ANTIDIM SET MI.

(1) *General.* The antidim set MI (fig. 4) is included as a component of all gas masks; it is usually held in the carrier by a small loop of cotton webbing. The set is used to reduce fogging of the lenses, thereby permitting clearer vision. Antidim does not reduce condensation of water vapor, but it causes the condensed vapor to form an even film on the lenses, thereby reducing the distortion which occurs when the vapor collects as drops.

(2) *Description.* The antidim set MI consists of a small cylindrical can containing a 6- by 10-inch piece of outing flannel. This cloth is impregnated with a substance which reduces the surface tension of water.

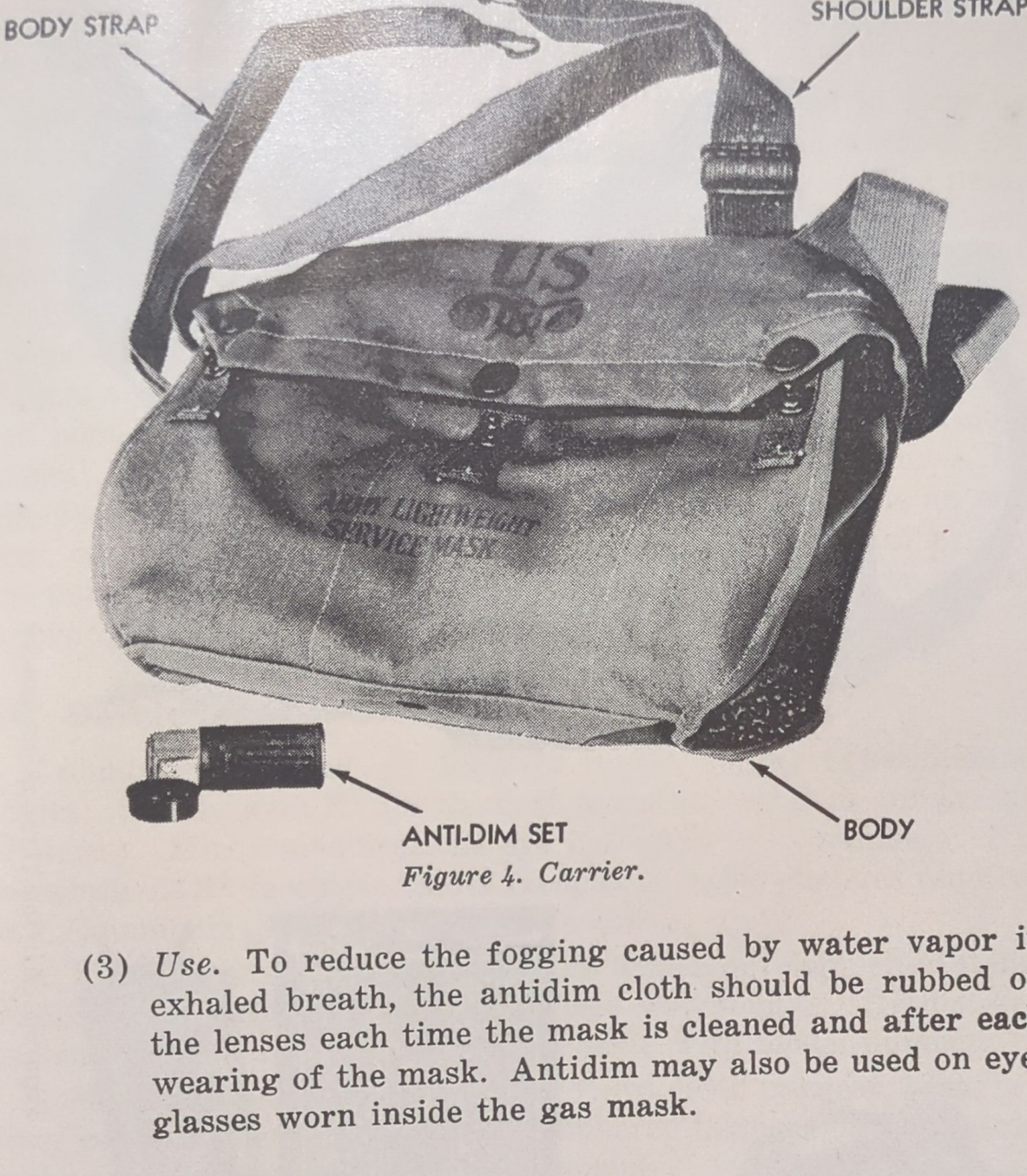


Figure 4. Carrier.

(3) *Use.* To reduce the fogging caused by water vapor in exhaled breath, the antidim cloth should be rubbed on the lenses each time the mask is cleaned and after each wearing of the mask. Antidim may also be used on eyeglasses worn inside the gas mask.

8. Function

The gas mask operates as an air purifier. Airflow through masks with intervening hose and masks with canister attached directly to facepiece is illustrated in figure 5. As the individual inhales, outside air is drawn into the canister. The air passes through the mechanical filter (except in some special canisters), which removes solid and liquid particles; through the chemical filling, which adsorbs or neutralizes any war gases; and out the nozzle of the canister through the hose to the facepiece. (If there is no hose, air flows directly from canister to facepiece.) When air enters facepiece, it flows through the deflectors, which help to prevent fogging of the lenses by forcing the incoming air to be swept over them. Air is then drawn into the respiratory passages; exhaled air is expelled from the mask through the outlet valve.

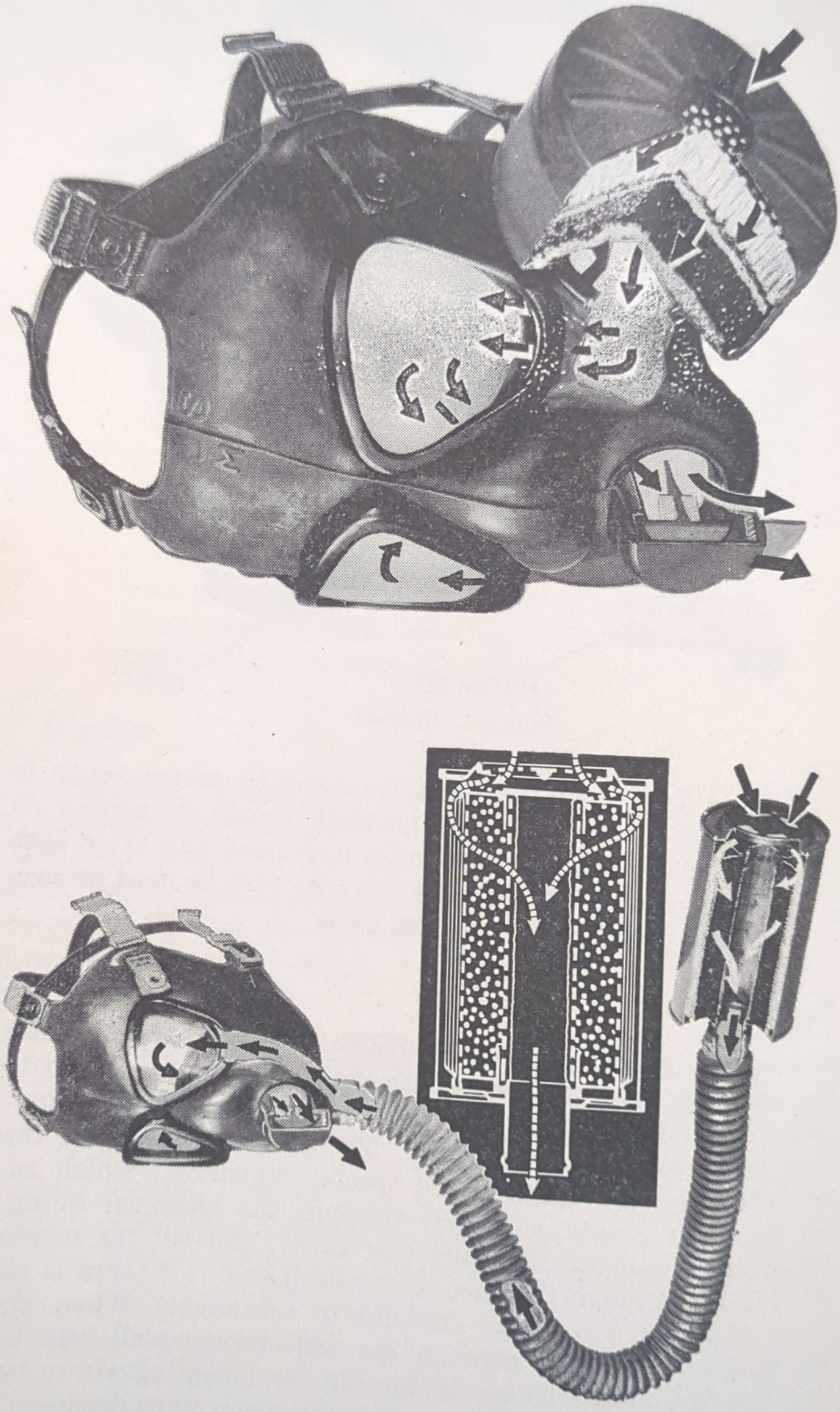


Figure 5. Airflow through gas masks.

Section III. IDENTIFICATION

9. General

Gas masks and their components are identified as to item by *nomenclature* which consists of a *model number* and a *name*, for example, M9 gas mask, C15 outlet valve, E49 facepiece. The name is established by the item concerned and is limited to the basic noun and the least possible number of descriptive adjectives. Arabic model numbers are assigned to all components and major assemblies. (Book of Standards nomenclature is all *reverse* nomenclature and capitalizes all important words. This text uses standard nomenclature for all items but no capitalization.) Developmental items all have E-numbers; standardized items have M-numbers or C-numbers depending on whether the piece is an end item or a component. Paragraphs 10, 11, and 12 explain briefly the numbering system employed. Examples cited may be actual or hypothetical.

10. Developmental Items

E-numbers are used to identify items during experimental stages, starting with E1 for the first model of any item (or group of items). Minor modifications are indicated by R-numbers: E1 facepiece, E1R1 facepiece, E1R2 facepiece; major changes require new E-numbers: E2 facepiece, E3 facepiece.

a. MAJOR COMPONENTS. A facepiece with a developmental item number may include some standardized components. (Canisters and carriers have no separate components with model numbers.)

b. MINOR COMPONENTS. An outlet valve, head harness, hose, or other component of a facepiece is numbered through development in the same manner as a major component.

c. GAS MASK ASSEMBLY.

(1) Prior to standardization, a gas mask is identified by its three major components whether they be standard or under development: E1–E2–E3 gas mask (consisting of E1 facepiece, E2 canister, and E3 carrier); E1–E2–E3R1; E1–M11–M7; E1–M11A1–M7.

(2) A *minor experimental* change in the C15R1 carrier of the M9 gas mask would result in the C48R1–M11–E15R2 gas mask.

11. Standardized Gas Mask

a. Some developmental models of gas masks eventually become adopted types (whether standard, substitute standard, or limited

standard) and an M-number is assigned; for example, M9. Minor modifications are indicated by addition of A-numbers: M9A1, M9A2.

b. Prior to December 1947, standardized gas masks were identified by three numbers in a manner similar to the system for designating developmental types. The letter "M" was not repeated: M8–11–10 gas mask (M8 facepiece, M11 canister, M10 carrier); M8A1–11–10; M8–11A1–10. All gas masks so numbered will continue to carry this identification.

c. In December 1947 the M9 gas mask was standardized. (Under the older system it would have been the M9–11–7A1 gas mask.) A minor approved change in any component would result in the addition of an A-number (M9A1); a major revision of any component would result in the M10 gas mask. All future standardizations will follow this system.

d. Prior to September 1940, Roman rather than Arabic numerals were used in model designation: MI, MII, MV, and MX; but MIA1. Post-1940 modifications to previously standardized items changed entire numbers; for example, the first minor change in the MIX canister resulted in the M9A1 canister.

12. Standardized Components

a. Most current components and all subsequent components (including major and minor components) are identified by C-numbers, with minor changes as R-numbers; for example, C15 carrier, C15R1 carrier.

b. Previously standardized major or minor components may be found with M-numbers: M11 canister, M8 outlet valve, MIVA1 carrier.

13. Facepiece Variations

a. In addition to name and number, gas masks are further designated as to size by a letter or letters on the facepiece forehead (fig. 6). The M9 mask is manufactured in small, medium, and large sizes and is marked S, M, or L. In earlier model gas masks, small, universal, and large sizes were manufactured, with the universal size corresponding to medium. Manufacturing deviations in the medium size led to the markings SU and LU.

b. Cheek-canister gas masks are made with the canister mounting piece at left and right cheek locations (7 percent are made to have right cheek canisters for men who cannot properly perform their duties wearing masks with left cheek canisters).

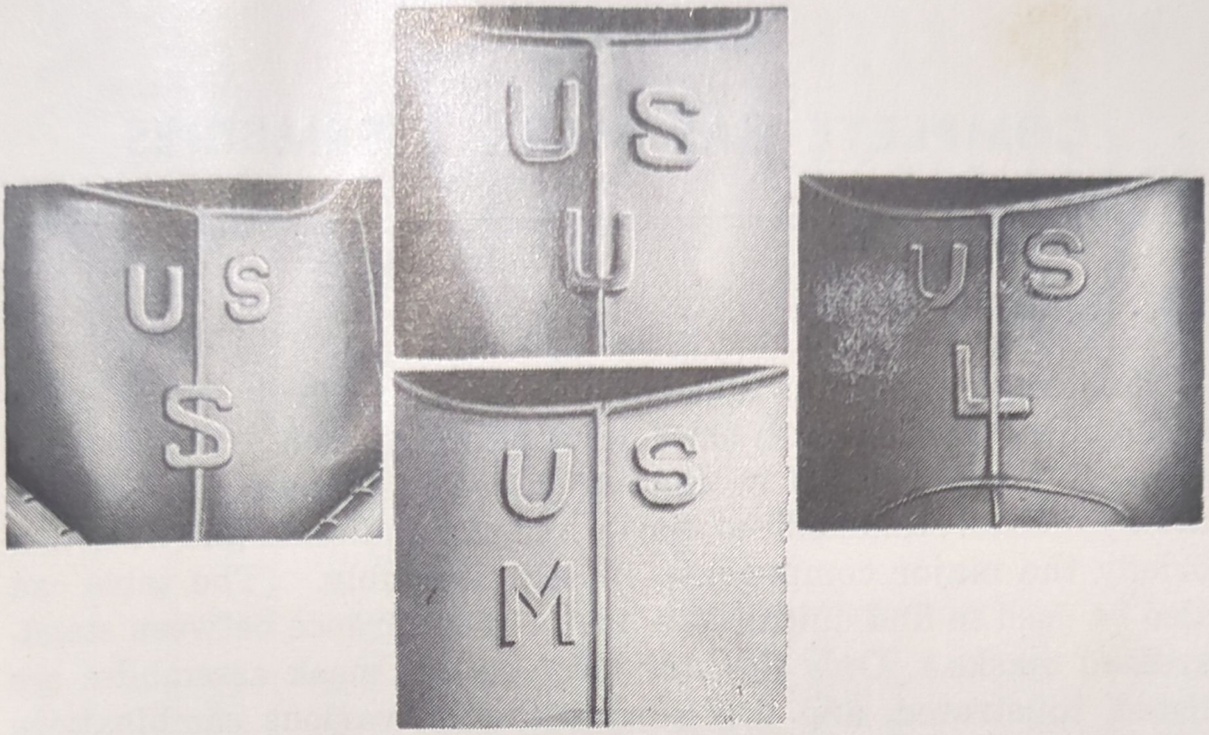


Figure 6. Faceblank size designations.

CHAPTER 2

COMPLETE GAS MASK ASSEMBLIES

14. General

This chapter contains illustrations of all standardized gas mask assemblies, together with brief descriptions of each. (Components are described in detail in chapter 3.) For further convenience, table I lists all standardized masks and also indicates and describes briefly the major components of each assembly. (The table can also be used to find quickly the points of difference between standardized masks.) Only the standardized gas mask assemblies are listed, illustrated, and described, although various combinations of major components may be assembled to make a complete mask. For example, the M3A1 facepiece might be used in place of the M3 model, since the only difference is the type of outlet valve used. Some experimental type components or complete assemblies may be encountered in the field. Such items are not covered in this manual. The mask assemblies discussed in this chapter are grouped as lightweight service gas masks, lightweight optical gas mask, gas mask M9, snout-type service gas mask, and headwound gas mask. Paragraphs 21 and 22 describe special gas masks, although they are more fully described in chapter 3 under the special purpose canisters.

15. Lightweight Service Gas Masks

a. Lightweight service gas masks afford protection equivalent to that of the standard service masks formerly used, except that the duration of the protection is not always as long.

b. Facepieces of all lightweight service masks have triangular lenses, rounded at the corners and curved on a cylindrical surface. Lenses are made of molded plastic or laminated glass and are interchangeable with all triangular lenses of other facepieces. All lightweight service facepieces are provided with hose and nosecups.

c. Differences between models of the lightweight service gas mask series may be quickly determined by consulting table I.

d. A waterproofing set (fig. 7), provided to afford a means of keeping the canister dry, is issued with each lightweight service gas mask.

Table I. Gas Mask Assemblies and Components

	FACEPIECE						CANISTER			
GAS MASK ASSEMBLIES	Model number	Sizes	Outlet valve	Head harness	Connection to canister	Rifle skid	Model number	Color	Shape	Chemical filling
Snout-type service gas mask M8–11–10	M8 (C5–2–714) —— M8 alternate (C5–2–731)	S, U, L	C15	C4	Canister mounting adapter.	None —— Present	M11 (C5–3–588)	Dark gray or black.	Squat cylindrical.	Activated charcoal (type ASC)
Headwound gas mask M7–11–9	M7 (C5–2–628)	One standard	M8	None	Canister mounting piece.	None	M11 (C5–3–588)	Dark gray or black.	Squat cylindrical.	Activated charcoal (type ASC)
Special gas mask M2A2-acid vapor MI–IIIA1	M2A2 (C5–2–401)	S, U, L	M8	M7	Hose MII	Present	Acid vapor MI (B5–3–179)	White	Rectangular	Soda lime
Special gas mask M2A2-all-purpose MI–IIIA1	M2A2 (C5–2–401)	S, U, L	M8	M7	Hose MII	Present	All-purpose MI (B5–3–38)	Red	Rectangular	Activated charcoal, silica gel, caustic pumice, and hopcalite.
Special gas mask M2A3-all-purpose MI–IIIA1	M2A3 (C5–2–618)	S, U, L	C15	M7	Hose MII	None	All-purpose MI (B5–3–38)	Red	Rectangular	Activated charcoal, silica gel, caustic pumice, and hopcalite.

Table I. Gas Mask Assemblies and Components—Continued.

	FACEPIECE						CANISTER			
GAS MASK ASSEMBLIES	Model number	Sizes	Outlet valve	Head harness	Connection to canister	Rifle skid	Model number	Color	Shape	Chemical filling
Special gas mask M2A2-ammonia M2–IVA1	M2A2 (C5–2–401)	S, U, L	M8	M7	Hose MII	Present	Ammonia M2 (B5–3–637)	Green	Rectangular	Silica gel
Special gas mask M2A2–HCN M2–IVA1	M2A2 (C5–2–401)	S, U, L	M8	M7	Hose MII	Present	HCN M2 (B5–3–631)	Sides: yellow Top: white	Rectangular	Activated charcoal (type ASC)
Special gas mask M2A3-oil vapor MI–IIIA1	M2A3 (C5–2–618)	S, U, L	C15	M7	Hose MII	None	Oil vapor MI (B5–3–80)	Black	Rectangular	Activated charcoal
Special gas mask M2A2-oil vapor MI–IIIA1	M2A2 (C5–2–401)	S, U, L	M8	M7	Hose MII	None	Oil vapor MI (B5–3–80)	Black	Rectangular	Activated charcoal
Lightweight service gas mask M3–10A1–6	M3 (C5–2–462)	S, U, L	M8	M7	Hose M3	None	M10A1 (C5–3–547)	Warm drab	Cylindrical	Activated charcoal (type ASC)
Lightweight service gas mask M3A1–10A1–6	M3A1 (C5–2–621)	S, U, L	C15	M7	Hose M3	None	M10A1 (C5–3–547)	Warm drab	Cylindrical	Activated charcoal (type ASC)
Lightweight service gas mask M4–10A1–6	M4 (None)	U	M8	M7	Hose M3	Present	M10A1 (C5–3–547)	Warm drab	Cylindrical	Activated charcoal (type ASC)

Lightweight service gas mask M4A1–10A1–6	M4A1 (None)	S, U, L	C15	M7	Hose M3	Present	M10A1 (C5–3–547)	Warm drab	Cylindrical	Activated charcoal (type ASC)
Lightweight optical gas mask M2–10A1–6	M2 (C5–2–524)	S, U, L	Part of angle-tube (C15 type)	M7	Hose M3	None	M10A1 (C5–3–547)	Warm drab	Cylindrical	Activated charcoal (type ASC)
Gas mask M9----------	C48R1 (C5–2–759)	S, M, L	C15	C8	Canister mounting piece	None	M11 (C5–3–588)	Dark gray or black.	Squat cylindrical.	Activated charcoal (type ASC)

Table I. Gas Mask Assemblies and Components—Continued.

GAS MASK ASSEMBLIES	CARRIER				
	Filter	Model number	Shape	Color and material	Weight without accessories
Snout-type service gas mask M8–11–10	Type 6	M10 (C5–4–265)	Sack shaped	Olive-drab waterproofed duck.	2.7
Headwound gas mask M7–11–9	Type 6	M9 (C5–4–240)	Sack shaped	Vinyl resin sheeting.	1.4
Special gas mask M2A2-acid vapor MI–IIIA1	None	MIIIA1 (C5–4–20)	Irregularly shaped, flat bag.	Olive-drab waterproofed duck.	5.6
Special gas mask M2A2-all-purpose MI–IIIA1	None	MIIIA1 (C5–4–20)	Irregularly shaped, flat bag.	Olive-drab waterproofed duck.	6.0
Special gas mask M2A3-all-purpose MI–IIIA1	None	MIIIA1 (C5–4–20)	Irregularly shaped, flat bag.	Olive-drab waterproofed duck.	6.0
Special gas mask M2A2-ammonia M2–IVA1	None	MIVA1 (C5–4–79)	Irregularly shaped, flat bag.	Olive-drab waterproofed duck.	5.7
Special gas mask M2A2–HCN M2–IVA1	Type 5	MIVA1 (C5–4–79)	Irregularly shaped, flat bag.	Olive-drab waterproofed duck.	5.3
Special gas mask M2A3-oil vapor MI–IIIA1	None	MIIIA1 (C5–4–20)	Irregularly shaped, flat bag.	Olive-drab waterproofed duck.	5.3
Special gas mask M2A2-oil vapor MI–IIIA1	None	MIIIA1 (C5–4–20)	Irregularly shaped, flat bag.	Olive-drab waterproofed duck.	5.3
Lightweight service gas mask M3–10A1–6	Type 5	M6 (C5–4–144)	Rectangular bag.	Olive-drab waterproofed duck.	3.6
Lightweight service gas mask M3A1–10A1–6	Type 5	M6 (C5–4–144)	Rectangular bag.	Olive-drab waterproofed duck.	3.6
Lightweight service gas mask M4–10A1–6	Type 5	M6 (C5–4–144)	Rectangular bag.	Olive-drab waterproofed duck.	3.6
Lightweight service gas mask M4A1–10A1–6	Type 5	M6 (C5–4–144)	Rectangular bag.	Olive-drab waterproofed duck.	3.6
Lightweight optical gas mask M2–10A1–6	Type 5	M6 (C5–4–144)	Rectangular bag.	Olive-drab waterproofed duck.	3.9
Gas mask M9	Type 6	C15R1 (C5–4–293)	Rectangular bag with wings at sides.	Waterproof-coated duck on inside.	3.5

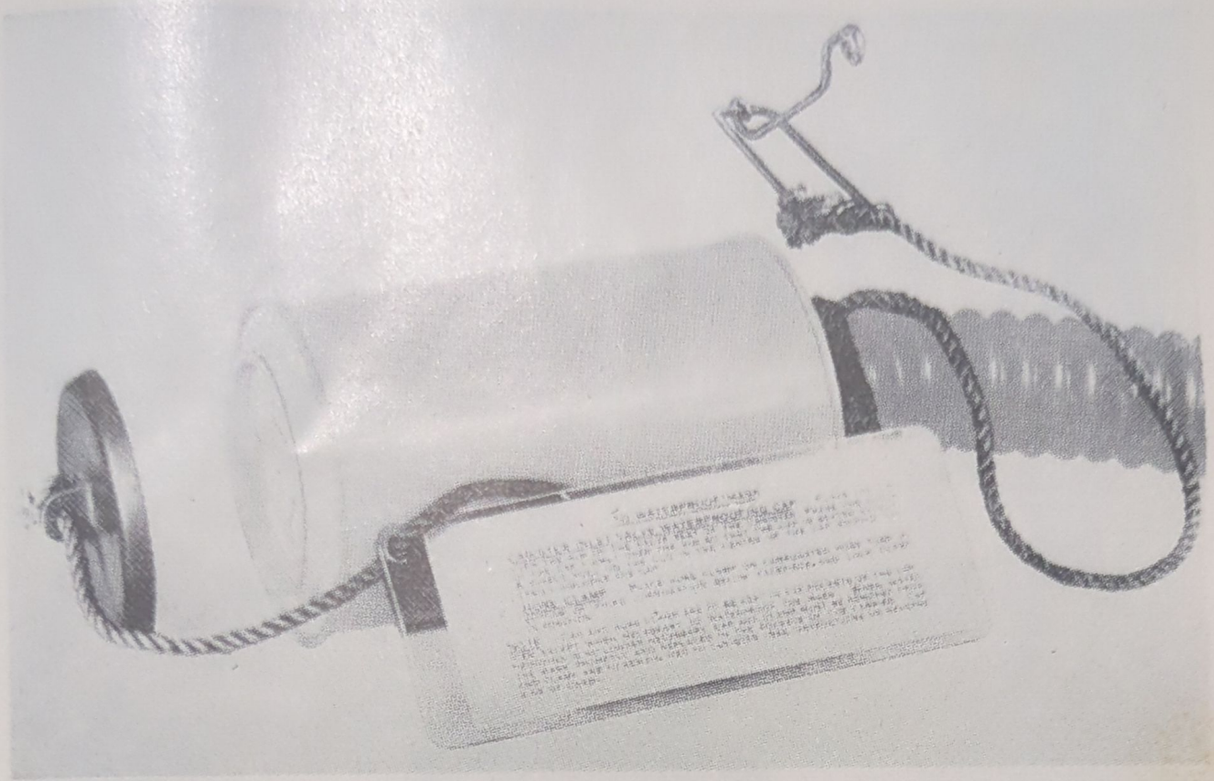


Figure 7. Lightweight service mask waterproofing set.

(1) Components of the set—a metal clamp for the hose, a rubber cap for the canister inlet valve, an instruction card, and a 38-inch length of cord—are tied to the canister nozzle by the cord and are carried in the pockets of the carrier.

(2) To waterproof the canister, place rubber canister cap over rim of canister valve seat, with edges pressed firmly over rim so that cap is seated evenly and cannot be dislodged easily. With the movable tongue in the bottom of the third corrugation below the facepiece, lock hose clamp in position on hose. Hose clamp must not be left on the hose except when needed for waterproofing. In the event the mask does get wet, hang it up to dry, with canister above facepiece and hose. Allow water to drain from the hose and facepiece before removing the clamp. Allow mask to remain in this position until it is thoroughly dry. If mask must be donned when wet, shake all water from mask and carrier before removing waterproofing equipment.

16. Standardized Lightweight Service Masks

The standardized lightweight service masks are illustrated in figures 8 through 11.

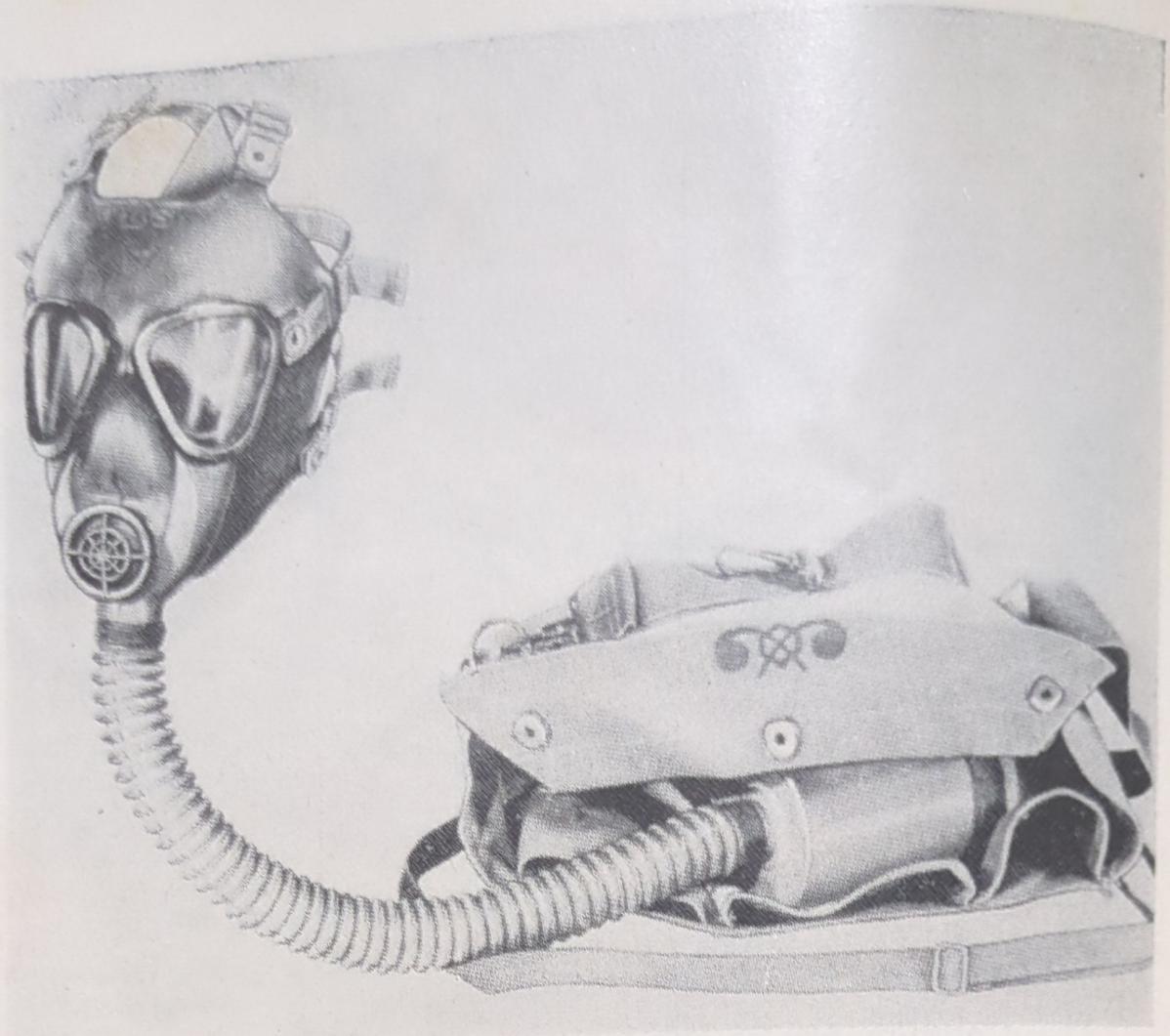


Figure 8. Mask, gas, service, lightweight, M3–10A1–6.

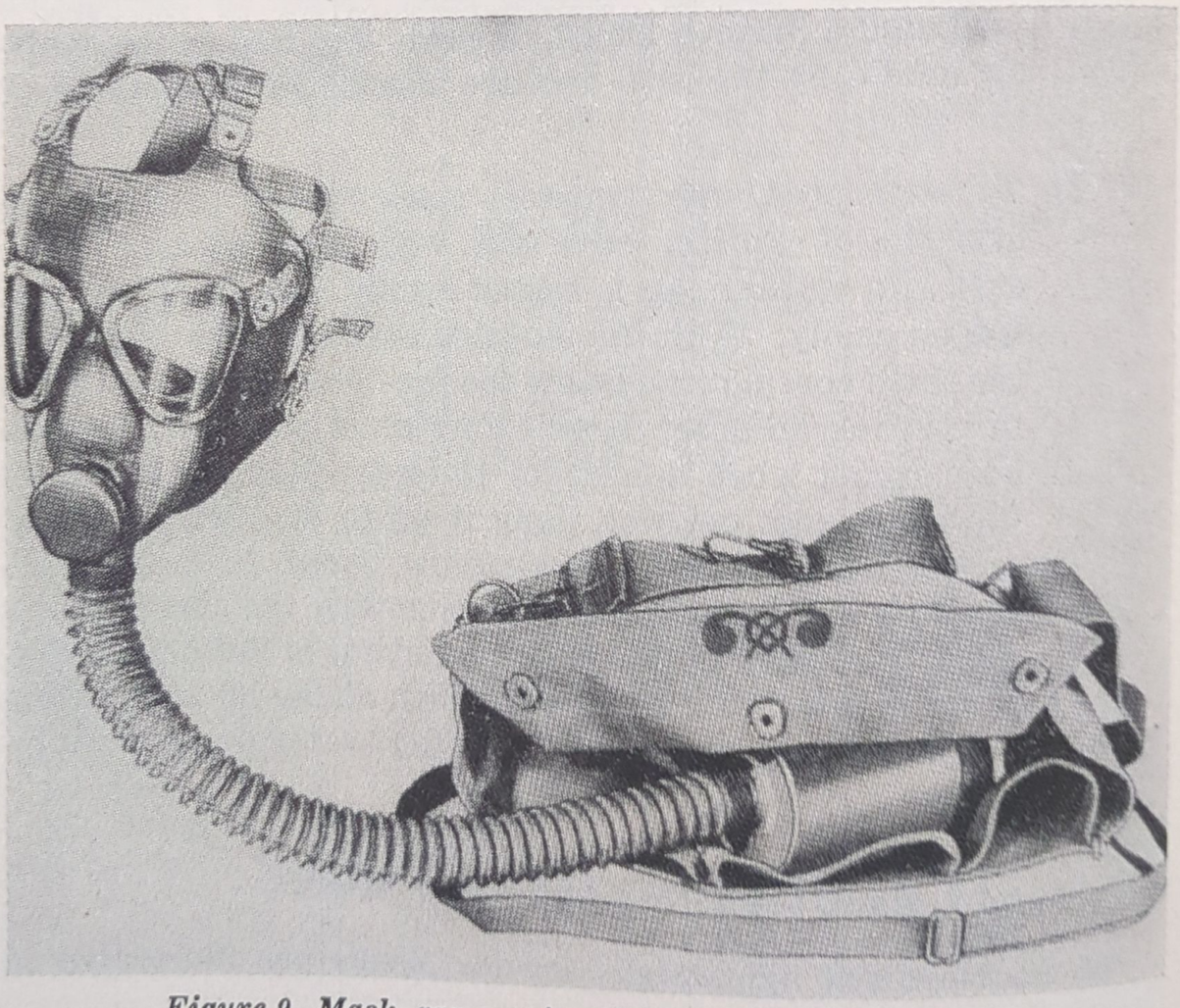


Figure 9. Mask, gas, service, lightweight, M3A1–10A1–6.

Figure 10. Mask, gas, service, lightweight, M4–10A1–6.

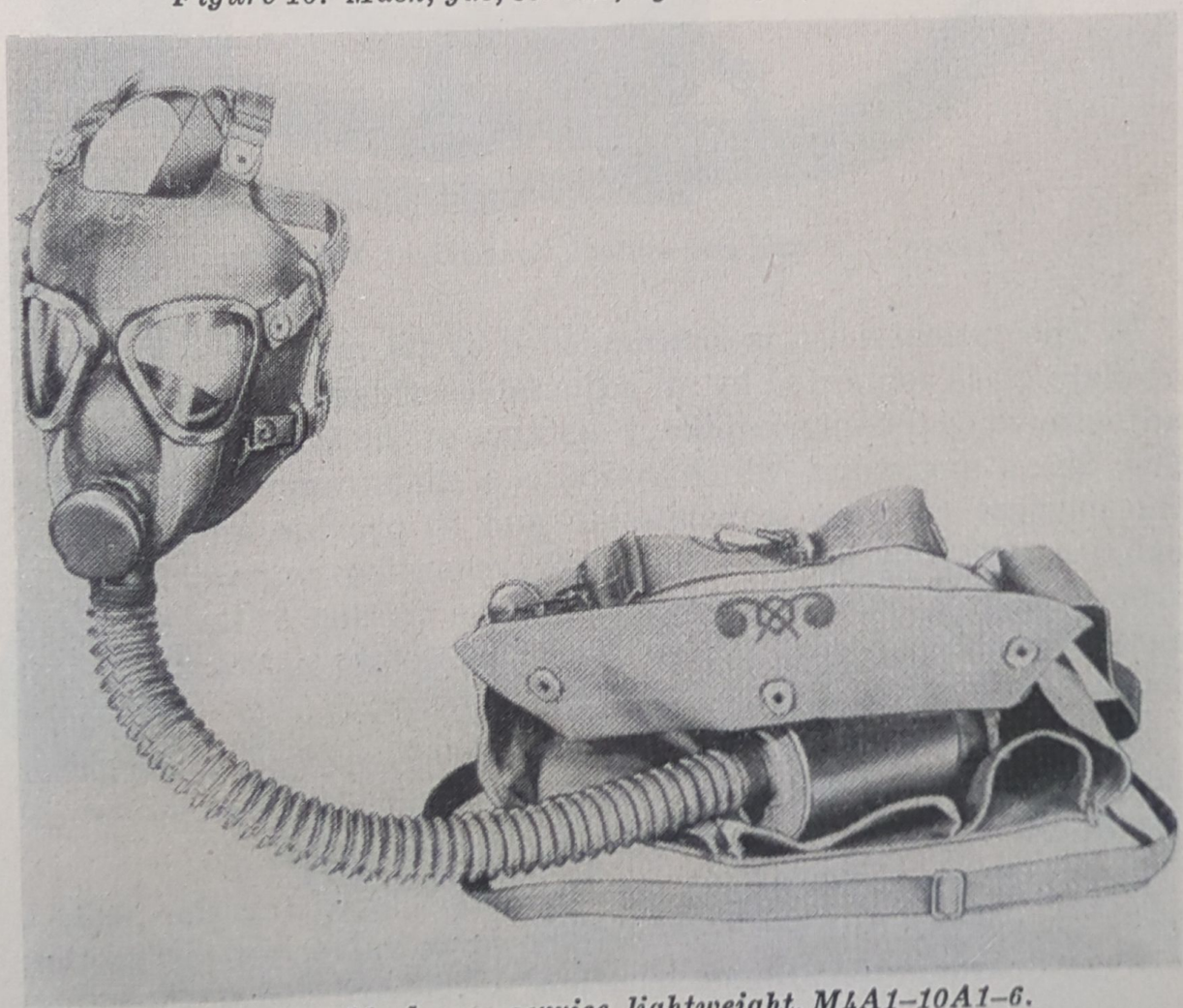


Figure 11. Mask, gas, service, lightweight, M4A1–10A1–6.

17. Lightweight Optical Gas Mask

a. The mask, gas, optical, lightweight, M2–10A1–6 (fig. 12) is issued to personnel who use optical instruments such as telescopic gun sights, range finders, and binoculars. Because the lenses are small, the field of vision of the optical mask is limited, and its use is restricted to special circumstances requiring only narrow vision.

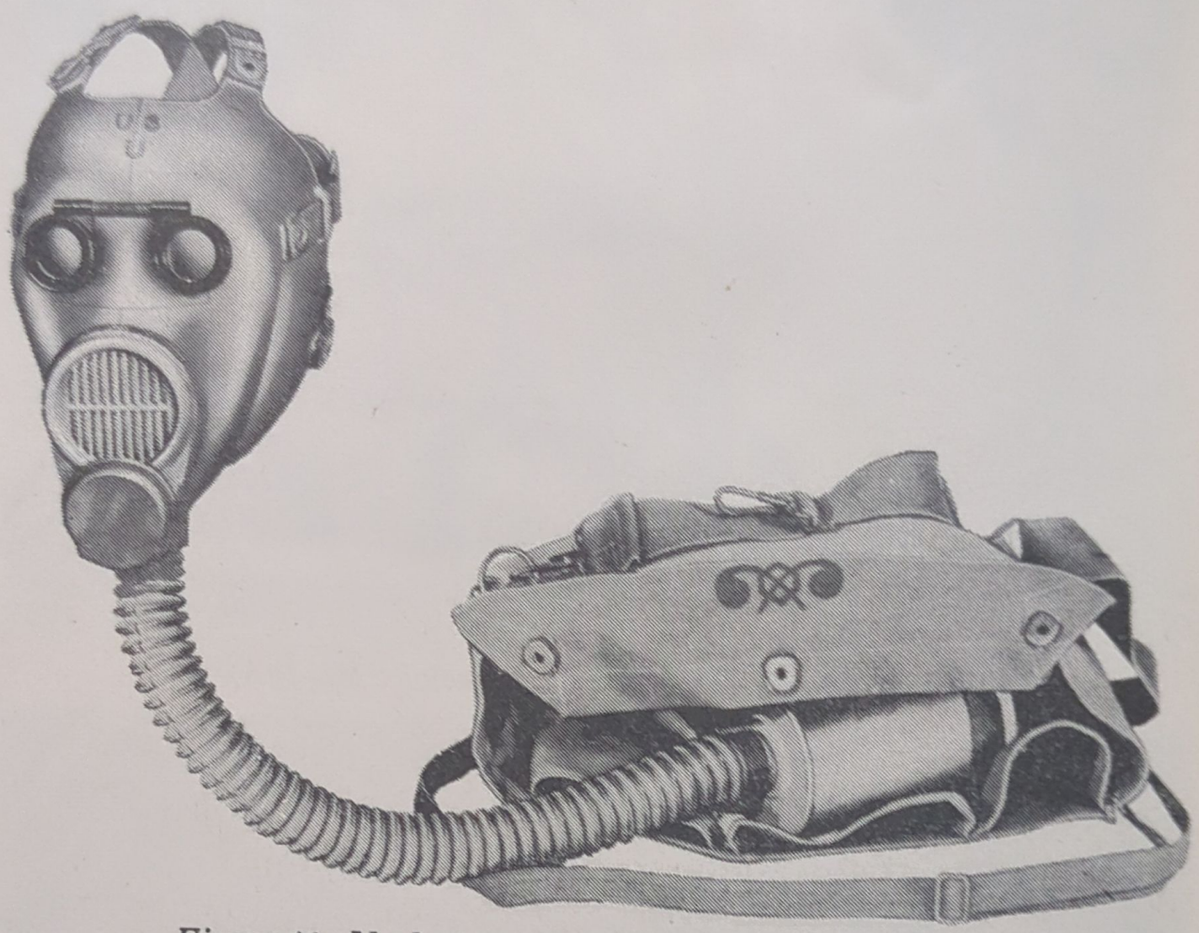


Figure 12. Mask, gas, optical, lightweight, M2–10A1–6.

b. The optical mask is distinguished by its small circular lenses of plate glass connected by an adjustable bridge, which facilitates adjustment to the interpupillary distance of the eyes of the wearer, and by an angletube, which contains a diaphragm assembly for the purpose of voice transmission and to provide an outlet for exhaled air while at the same time preventing contaminated air from entering the mask. The outlet valve portion of the assembly resembles the C15 outlet valve. The lightweight optical gas mask has a hose connected to a cylindrical canister.

c. A waterproofing set (fig. 7), provided to afford a means of keeping the canister dry, is issued with each lightweight optical gas mask.

(1) Components of the set—a metal clamp for the hose, a rubber cap for the canister inlet valve, an instruction card, and a 38-inch length of cord—are tied to the canis-

ter nozzle by the cord and are carried in the pockets of the carrier.

(2) To waterproof the canister, place rubber canister cap over rim of canister valve seat, with edges pressed firmly over rim so that cap is seated evenly and cannot be dislodged easily. With the movable tongue in the bottom of the third corrugation below facepiece, lock hose clamp in position on hose. Hose clamp must not be left on the hose except when needed for waterproofing. In the event mask gets wet, hang it up to dry, with canister above facepiece and hose. Allow water to drain from hose and facepiece before removing the clamp. Allow mask to remain in this position until it is thoroughly dry. If mask must be donned when wet, shake all water from mask and carrier before removing waterproofing equipment.

18. Snout-Type Service Gas Mask

The mask, gas, service, snout-type, M8–11–10 (fig. 13) is designed primarily for use by assault troops. It is distinguished by its canister, which is connected directly to the facepiece at the chin position.

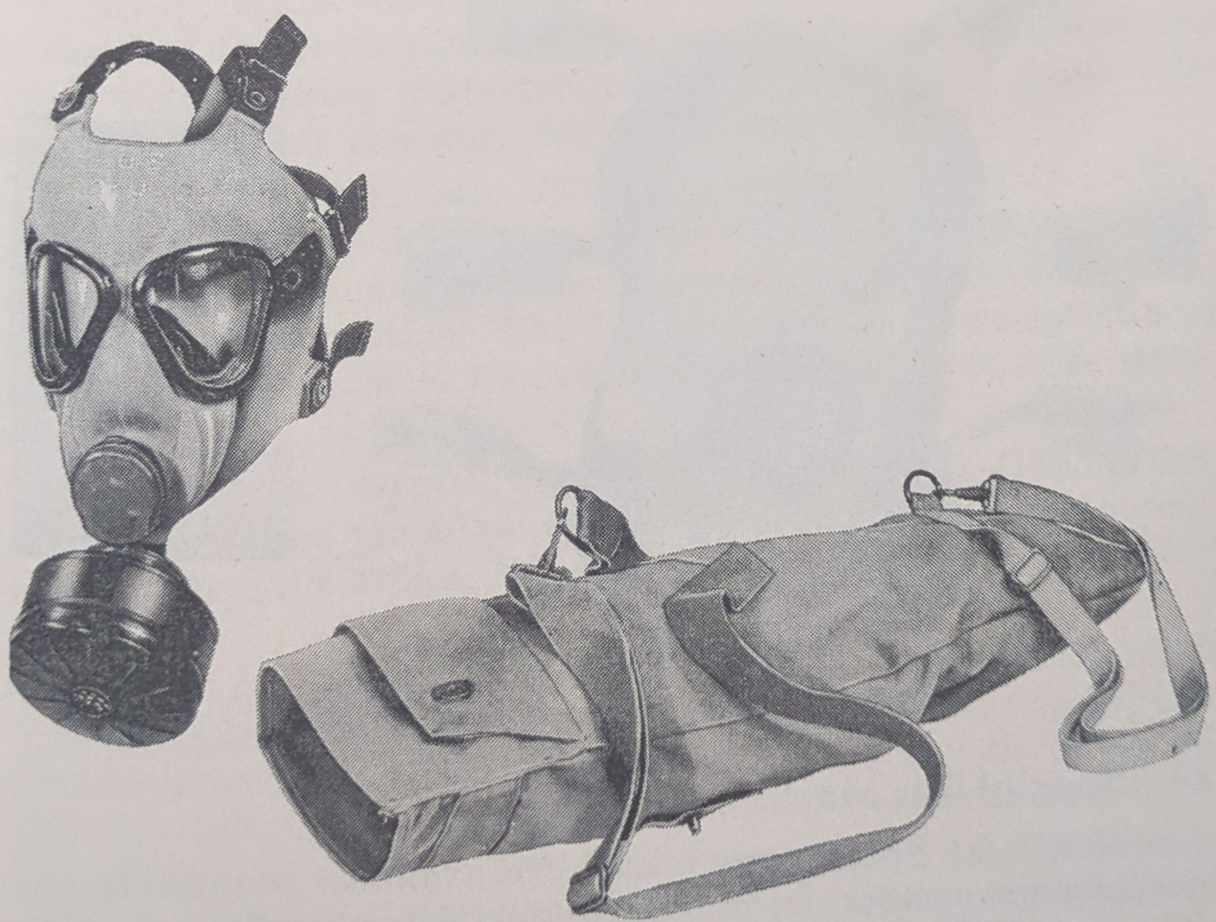


Figure 13. Mask, gas, service, snout-type, M8–11–10.

19. Gas Mask, M9

The mask, gas, M9 (fig. 14) is distinguished by its canister, which is connected directly to the facepiece at the cheek position.

Figure 14. Mask, gas, M9.

20. Headwound Gas Mask

The mask, gas, headwound, M7–11–9 (fig. 15) is designed for personnel unable to wear a service gas mask because of wounds on the head or neck; in such cases, the presence of bandages renders the use of ordinary masks unfeasible.

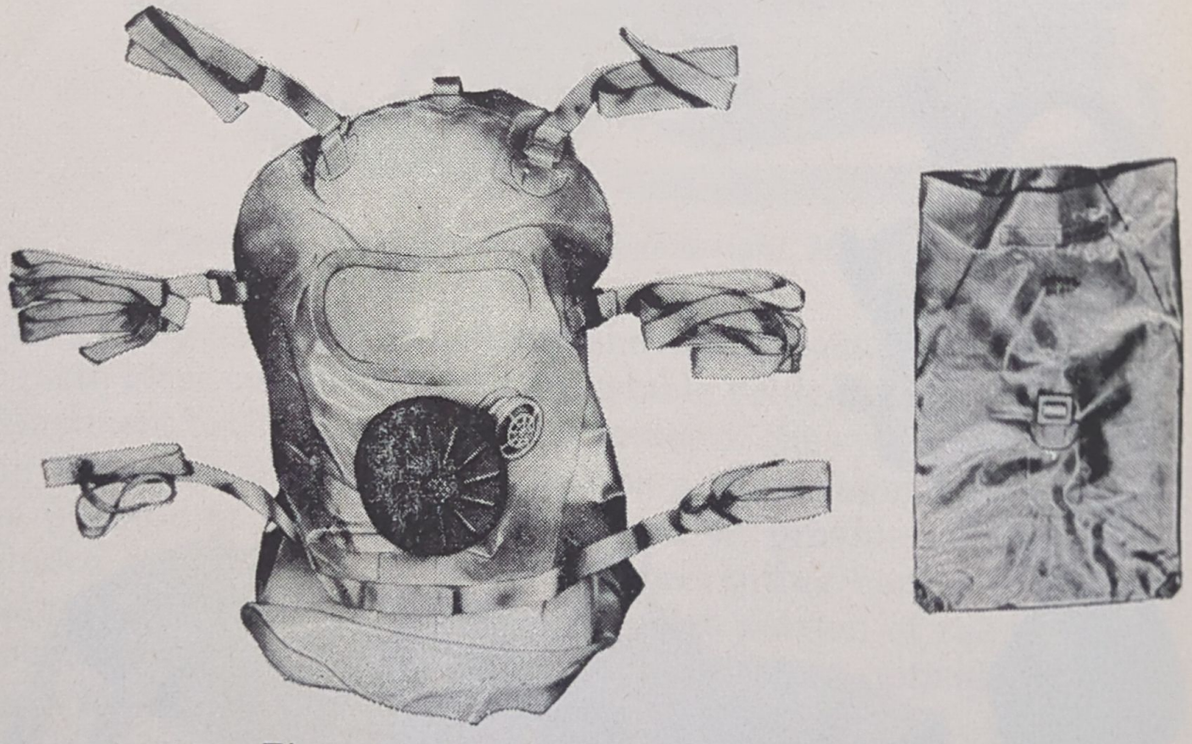


Figure 15. Mask, gas, headwound, M7–11–9.

21. Special Gas Masks

a. GENERAL. Special gas masks are available to military and civilian personnel for use in the manufacture or handling of chemical agents. The standardized assemblies are described in para-

graph 22. The distinctive feature of the special gas mask is the special purpose canister with which it is equipped, and although only the M2A2 and the M2A3 facepieces (together with the MIIIA1 and MIVA1 carriers) are authorized with special purpose canisters, the special gas mask can be assembled from other models of facepieces and carriers. The canisters themselves are described in detail in paragraphs 37 through 44. These masks (except the HCN and all-purpose masks) do not protect against war gases and smokes, and should not be used where the concentration of any toxic gas exceeds 1 percent by volume. (The all-purpose canister does not give adequate protection against irritant smokes.)

b. SPECIAL PURPOSE CANISTERS. The canisters used in special gas masks differ considerably in internal design from ordinary canisters. Canisters of special masks are painted distinctive colors for quick identification. Nomenclature differs from that of other canisters in that the type of protection afforded by each canister is included with the model number; for example, acid vapor MI. For a complete description of the chemical fillings of special purpose canisters, agents protected against, limitations of the canisters, and cautions, see paragraphs 40–44.

22. Standardized Special Gas Masks

a. MASK, GAS, SPECIAL, M2A2-ACID VAPOR MI–IIIA1. This mask is designed for protection against gases having acidic properties. Chief distinguishing characteristic of the acid vapor mask is its *white* rectangular canister. See paragraph 40.

b. MASK, GAS, SPECIAL, M2A2-ALL-PURPOSE MI–IIIA1. This mask affords protection for a limited time against acid vapors, organic vapors, ammonia, carbon monoxide, and smokes produced by ordinary combustion. Chief distinguishing characteristic of the all-purpose mask is its *red* rectangular canister. See paragraph 41.

c. MASK, GAS, SPECIAL, M2A3-ALL-PURPOSE MI–IIIA1. This mask differs from the all-purpose mask described in *b* above only in that it uses the M2A3 facepiece assembly instead of the M2A2 assembly.

d. MASK, GAS, SPECIAL, M2A2-OIL VAPOR MI–IIIA1. This mask is designed for protection against oil vapors, solvent vapors, and similar compounds. Chief distinguishing characteristic of the oil vapor mask is its *black* rectangular canister. See paragraph 42.

e. MASK, GAS, SPECIAL, M2A3-OIL VAPOR MI–IIIA1. This mask differs from the oil vapor mask described in *d* above only in that it uses the M2A3 facepiece assembly instead of the M2A2.

f. MASK, GAS, SPECIAL, M2A2-AMMONIA M2–IVA1. This mask is designed for protection against concentrations of ammonia gas. Chief distinguishing characteristics of the ammonia mask is its *green* rectangular canister. See paragraph 43.

g. MASK, GAS, SPECIAL, M2A2-HCN M2–IVA1. This mask is designed primarily for protection against concentrations of hydrogen cyanide and cyanogen chloride customarily used in fumigating buildings and ships, and against other acid and organic vapors. Chief distinguishing characteristic of the HCN mask is its rectangular canister, which is painted *yellow* with a white top. See paragraph 44.

CHAPTER 3

COMPONENTS

Section I. FACEPIECES

23. M2 Series

The service facepiece assemblies of the M2 series differ only in minor details. The service facepiece assembly M2A2 has the outlet valve assembly M8. The faceblank of the service facepiece assembly M2A3 is cut slightly different near the rear edges and has no rifle skids. It employs the C15 outlet valve. The cheek tab assemblies are riveted to mounds on projections at the rear edges of the cheek surfaces of the faceblank so that there are no mounds on the cheek surfaces proper.

24. Service Facepiece Assembly M2A2
(fig. 16)

a. FACEBLANK.

(1) *General.* The faceblank of service facepiece M2A2 is made of molded rubber in small, universal, and large sizes.

(2) *Deflector tubes.* The deflector tubes, which cause incoming air to flow over the lenses to help prevent fogging, are integrally molded into the faceblank. They extend from the hose stem at the chin position along the cheeks to the eyepieces.

(3) *Attachments for tab assemblies.* Six square rubber mounds and four rubber bridges to secure the tab assemblies are molded into the faceblank. Two mounds and two bridges are at cheek positions, two are at temple positions, and two mounds are on projections at forehead positions.

(4) *Rifle skids.* Below the two rubber mounds at cheek positions are sloping rubber projections called rifle skids, which prevent the recoil of the rifle from tearing loose the button and washer connection of the cheek tab assembly.

b. TAB ASSEMBLIES. The six cotton webbing tab assemblies, with buckles attached, are used to fasten and adjust the head harness. Assemblies are riveted to the mounds on the faceblank, two at

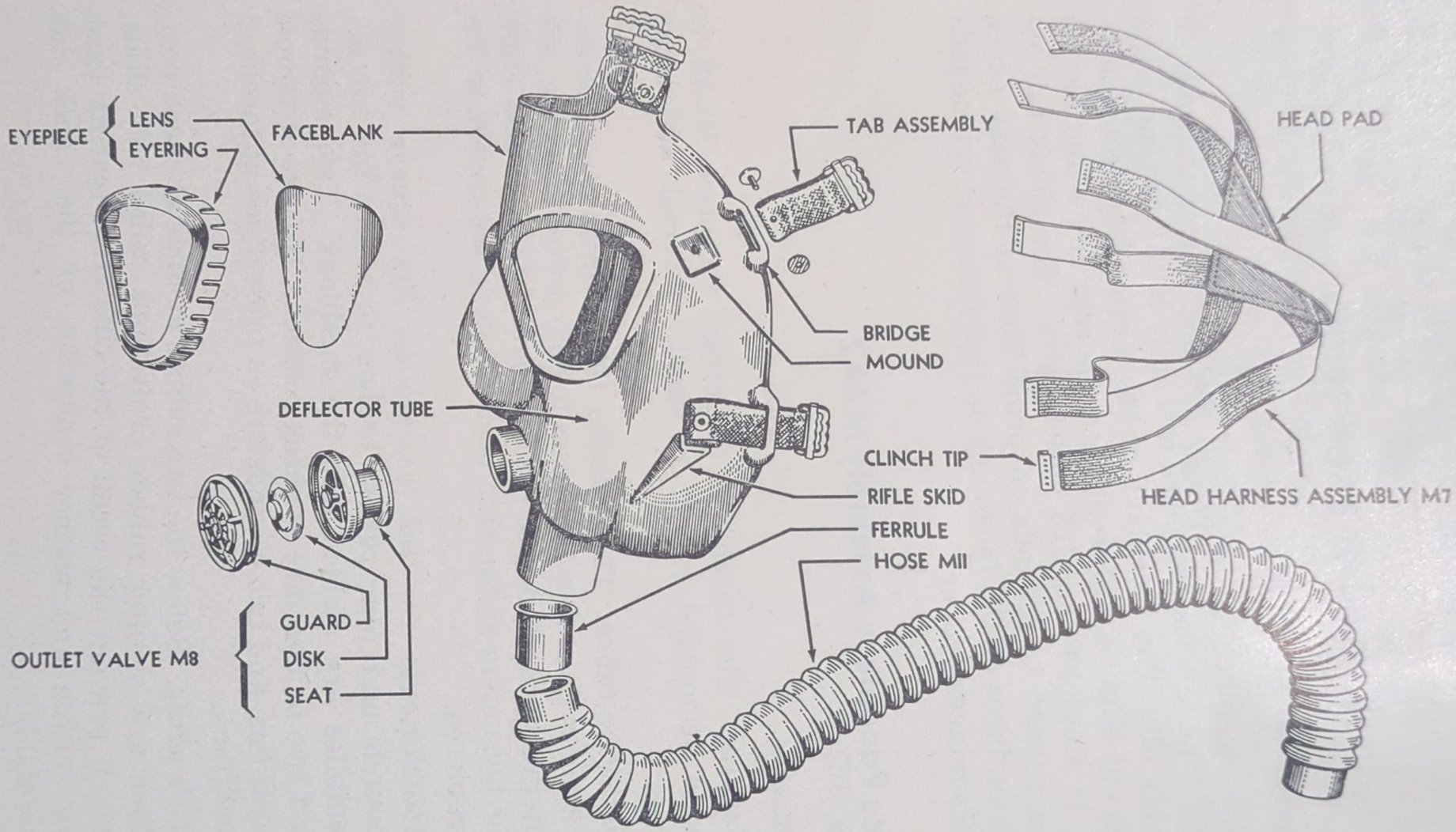


Figure 16. Service facepiece assembly M2A2.

cheek positions, two at temple positions, and two at forehead positions.

c. EYEPIECES. The eyepieces consist of lenses and metal eyerings. Eyerings are crimped to the rubber surrounding the lenses.

d. OUTLET VALVE ASSEMBLY M8. The facepiece has an M8 outlet valve assembly, which includes a rubber disk and a plastic case consisting of a seat and a guard. The seat has a flanged hollow stem that fits into the outlet valve nozzle of the faceblank, and a plug held in the center of the seat by six radial spokes. The plug is flanged to retain a rubber disk which is molded to receive the plug. Truncated conical sides on the disk fit against a correspondingly shaped portion of the smooth flanged surface in the case. A rim extends from the flange and is threaded internally to receive the corresponding threads of the guard. The guard has a shallow, dome-shaped grill to protect the disk and permit outflow of air.

e. HEAD HARNESS ASSEMBLY.

(1) The M7 head harness consists of three crossed straps of ⅞-inch elastic webbing with clinch tips on the ends to prevent raveling. One strap is attached at the right forehead buckle and left cheek buckle of the facepiece. A second strap is attached at the left forehead buckle and right cheek buckle. A third strap is attached at the two buckles at temple positions and crosses the other two straps which are stitched at each crossing. This junction has impermeable fabric applied inside and outside to form a triangular head pad.

(2) The MIIA1 head harness is used as an alternate for the M7. It consists of a rectangular head pad with six straps. Four of the straps are stitched (at one end) across the corners of the pad, and the other two straps are stitched to the sides of the pad. A piece of elastic webbing connects the two bottom straps a short distance below the head pad.

f. HOSE MII AND FERRULE. A 27-inch hose of natural or synthetic rubber is used with the M2A2 service facepiece. A metal ferrule is used to strengthen the opening at the connection of the hose and facepiece.

25. Service Facepiece Assembly M2A3

(fig. 17)

a. FACEBLANK.

(1) *General.* The faceblank of service facepiece M2A3 is made of molded rubber in small, universal, and large sizes. Cheek surfaces proper of this faceblank are smooth (no rifle skids or mounds).

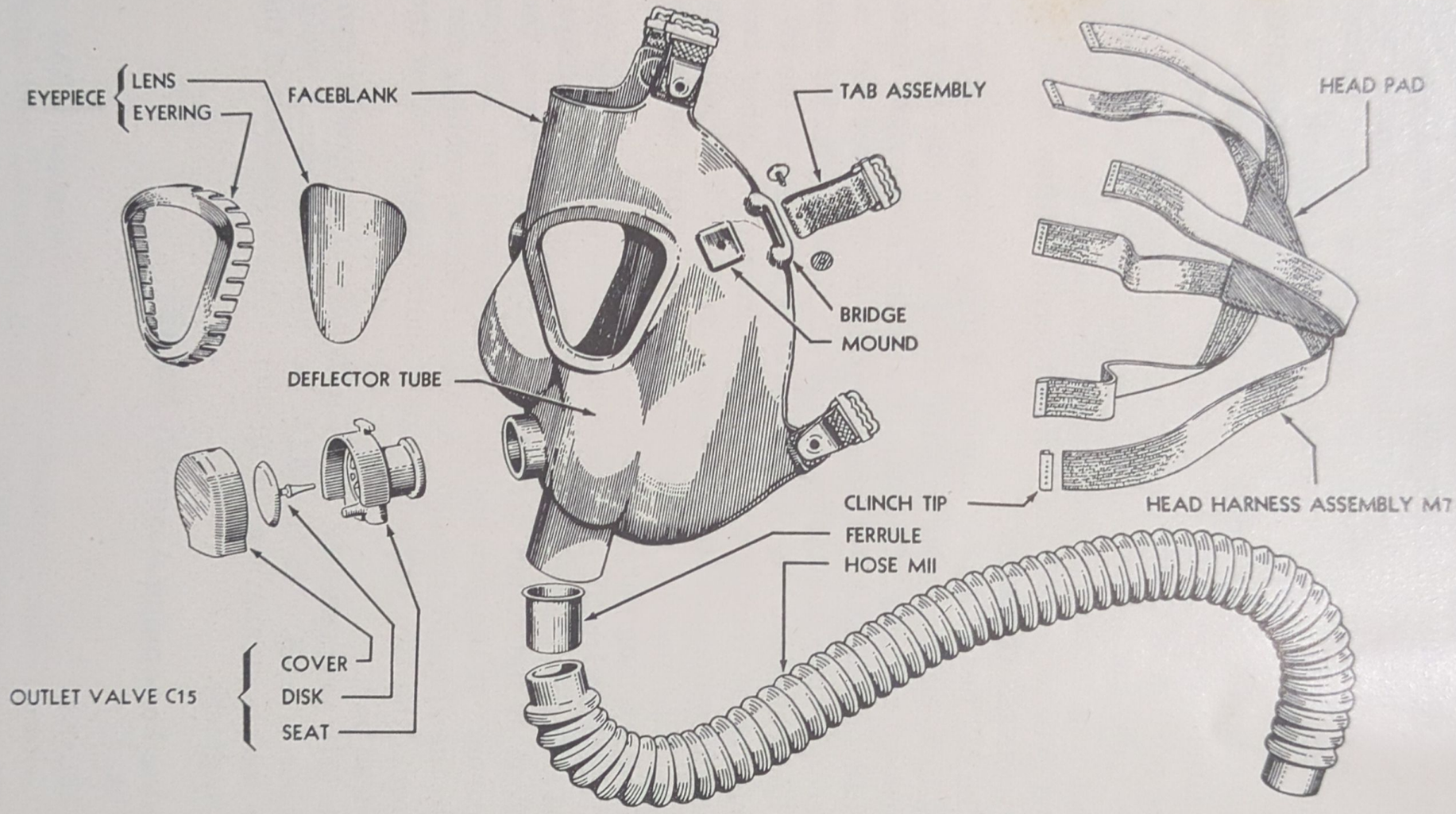


Figure 17. Service facepiece assembly M2A3.

(2) *Deflector tubes.* See paragraph 24*a*(2).

(3) *Attachments for tab assemblies.* Six square rubber mounds and two rubber bridges to secure the tab assemblies are molded into the faceblank. Two mounds are located on projections at cheek positions, two mounds and two bridges are at temple positions, and two mounds are on projections at forehead positions.

b. TAB ASSEMBLIES. See paragraph 24*b*.

c. EYEPIECES. See paragraph 24*c*.

d. OUTLET VALVE ASSEMBLY C15. The facepiece has a C15 outlet valve assembly composed of a die-cast aluminum seat, a rubber disk, and a molded rubber cover. The seat has a flanged hollow stem which fits into the outlet valve nozzle of the faceblank. In the center of the face of the seat is a hub, supported by six radial spokes, through which the stem of the rubber disk fits. When the stem is pulled through, the disk lies against a raised circular lip, providing a gastight seal. The seat of the valve has a semicircular metal canopy to insure free action of the disk. A slot at the bottom and a lug at the top of the seat aid in proper seating of the rubber cover. The cover protects the valve disk and provides a means of deicing by finger pressure. A group of small beads is molded on the inner surface of the cover both to assist in deicing and to eliminate the possibility of the valve disk adhering to the surface of the cover after exhalation. The bottom of the cover is equipped with a tab which is used to facilitate its removal. The air immediately around the exterior of the valve disk is always exhaled air and hence contamination-free; this factor eliminates the back leakage of even minute quantities of contaminated air when the valve disk is seating during inhalation.

Note. All C15 outlet valves function the same but may differ slightly in outward appearance. (Cover may or may not have a tab on it.)

e. HEAD HARNESS ASSEMBLY. See paragraph 24*e*.

f. HOSE MII AND FERRULE. A 27-inch hose of natural or synthetic rubber is used with the M2A3 service facepiece. A metal ferrule is used to strengthen the opening at the connection of the hose and facepiece.

26. M3 Series

The facepieces of the M3 series differ from those of the M2 series principally in that they have nose-cups. The M3 and the M3A1 facepiece assemblies differ from each other only in the outlet valve employed, the M3 using the M8 outlet valve and the M3A1 using the C15 outlet valve. The faceblank used for both masks is identical in mold to that of the M2A3 facepiece assembly (tab assemblies

at cheek positions are riveted to mounds on projections at the rear edges of the faceblank). The M3 hose is used with both the M3 and M3A1 facepiece assemblies.

27. Service Facepiece Assembly M3
(fig. 18)

a. FACEBLANK.

(1) *General.* The faceblank of service facepiece M3 is made of molded rubber in small, universal, and large sizes. Cheek surfaces proper of this faceblank are smooth (no rifle skids or mounds).

(2) *Deflector tubes.* See paragraph 24*a*(2).

(3) *Attachments for tab assemblies.* See paragraph 25*a*(3).

b. TAB ASSEMBLIES. See paragraph 24*b*.

c. EYEPIECES. See paragraph 24*c*.

d. OUTLET VALVE ASSEMBLY M8. See paragraph 24*d*.

e. HEAD HARNESS ASSEMBLY. See paragraph 24*e*.

f. HOSE M3 AND FERRULE. An 18-inch hose of natural or synthetic rubber is used with the M3 lightweight service facepiece. A metal ferrule is used to strengthen the opening at the connection of the hose and facepiece.

g. NOSE-CUP. The nose-cup, which covers the wearer's nose and mouth, prevents exhaled air from coming into contact with the lenses, thereby preventing fogging. A nose-cup valve assembly on each side of the nose-cup allows air to enter. Each of these inlet valves is composed of a metal seat and a rubber or rubberized fabric disk, which fits over a stud in the center of the seat. The valve seat is crimped tightly (without injuring the rubber) over the rubber bead of the nose-cup. The stem of the nose-cup is inserted through and folded back over the edge of the outlet valve nozzle and is held in place by the outlet valve. The nose-cup is further secured by vulcanizing or cementing it to the faceblank at the cheek position. The large nose-cup for the large size faceblank is equipped with a reinforcing wire placed horizontally on the outside of the nose-cup below the nose-cup valve assemblies. The large nose-cup is cemented at the chin section only.

28. Service Facepiece Assembly M3A1
(fig. 19)

a. FACEBLANK.

(1) *General.* The faceblank of service facepiece M3A1 is made of molded rubber in small, universal, and large sizes. Cheek surfaces proper of this faceblank are smooth (no rifle skids or mounds).

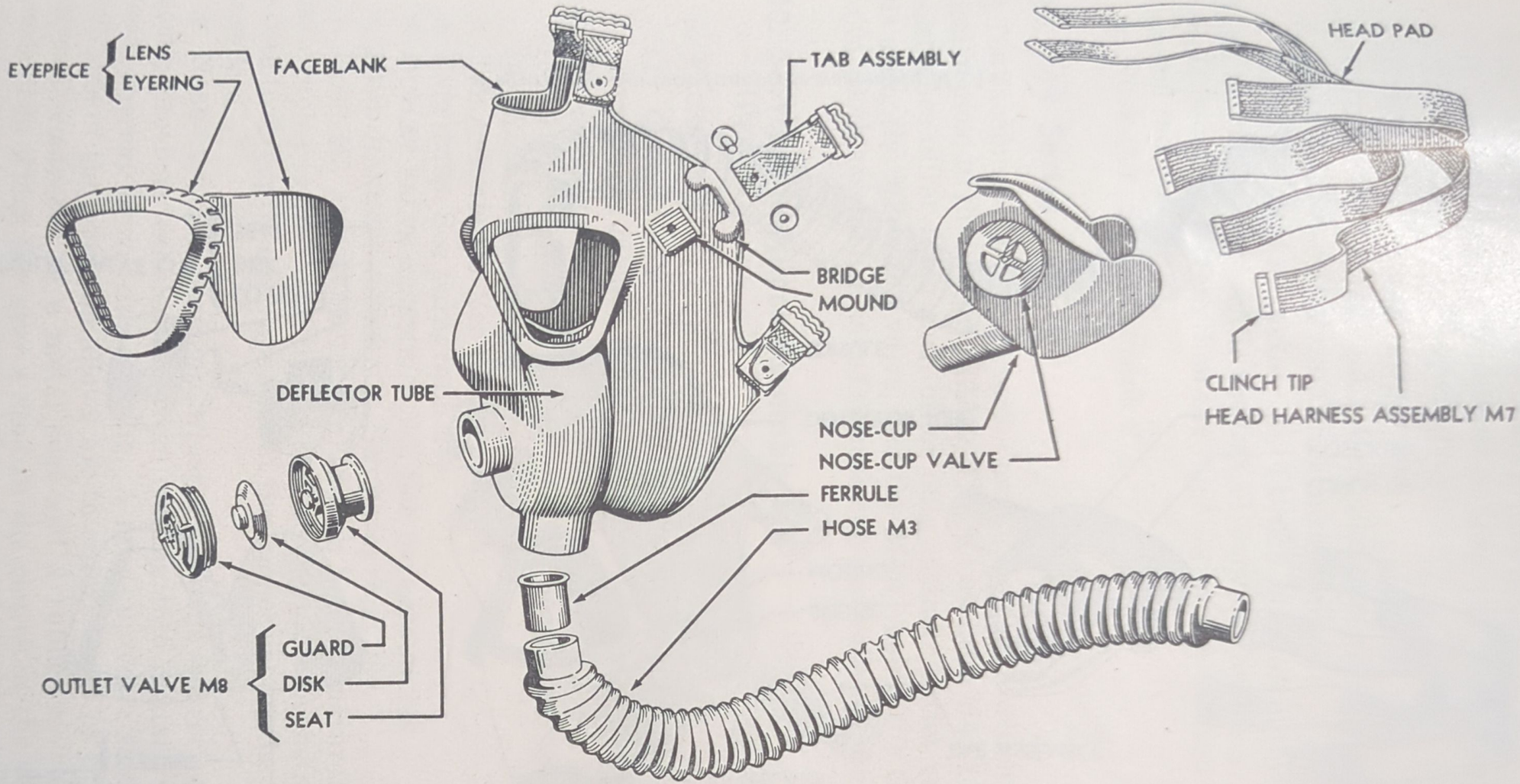


Figure 18. Service facepiece assembly M3.

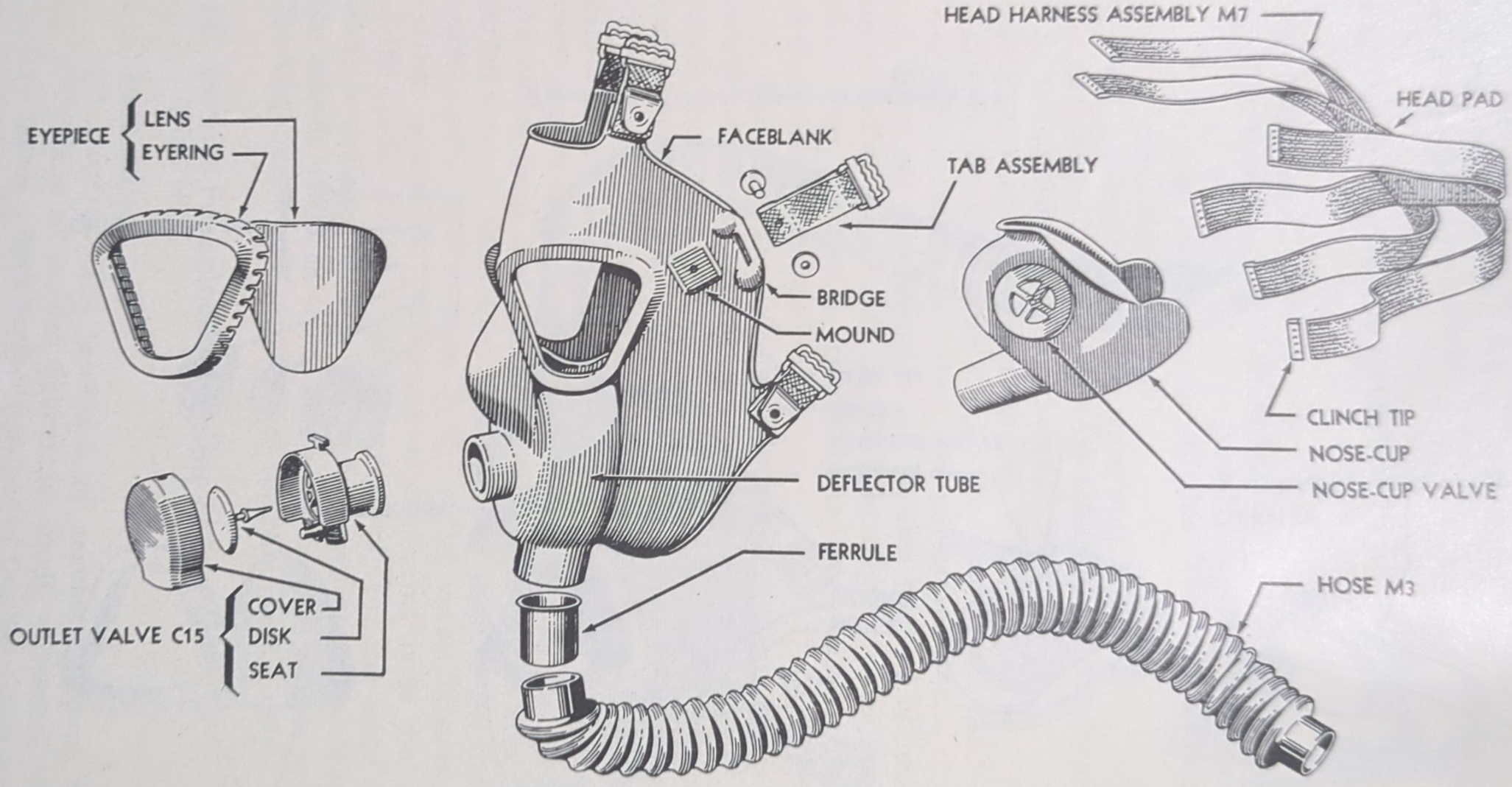


Figure 19. Service facepiece assembly M3A1.

(2) *Deflector tubes.* See paragraph 24*a*(2).

(3) *Attachments for tab assemblies.* See paragraph 25*a*(3).

b. TAB ASSEMBLIES. See paragraph 24*b*.

c. EYEPIECES. See paragraph 24*c*.

d. OUTLET VALVE ASSEMBLY C15. See paragraph 25*d*.

e. HEAD HARNESS ASSEMBLY. See paragraph 24*e*.

f. HOSE M3 AND FERRULE. An 18-inch hose of natural or synthetic rubber is used with the M3A1 service facepiece. A metal ferrule is used to strengthen the opening at the connection of the hose and facepiece.

g. NOSE-CUP. See paragraph 27*g*.

29. M4 Series

The facepieces of the M4 series have faceblanks which are identical in mold to that of the M2A2. The M4 and the M4A1 facepiece assemblies differ from each other only in their outlet valves, the M4 using the M8 outlet valve, and the M4A1 using the C15 outlet valve. Both assemblies have the nose-cup and both use the M3 hose.

30. Service Facepiece Assembly M4
(fig. 20)

a. FACEBLANK.

(1) *General.* The faceblank of the service facepiece M4 is made of molded rubber in universal size only.

(2) *Deflector tubes.* See paragraph 24*a*(2).

(3) *Attachments for tab assemblies.* See paragraph 24*a*(3).

(4) *Rifle skids.* See paragraph 24*a*(4).

b. TAB ASSEMBLIES. See paragraph 24*b*.

c. EYEPIECES. See paragraph 24*c*.

d. OUTLET VALVE ASSEMBLY M8. See paragraph 24*d*.

e. HEAD HARNESS ASSEMBLY. See paragraph 24*e*.

f. HOSE M3 AND FERRULE. An 18-inch hose of natural or synthetic rubber is used with the M4 service facepiece. A metal ferrule is used to strengthen the opening at the connection of the hose and facepiece.

g. NOSE-CUP. The nose-cup, which covers the wearer's nose and mouth, prevents exhaled air from coming into contact with the lenses, thereby preventing fogging. A nose-cup valve assembly on each side of the nose-cup allows air to enter. Each of these inlet valves is composed of a metal seat and a rubber or rubberized fabric disk, which fits over a stud in the center of the seat. The valve seat is crimped tightly (without injuring the rubber) over the rubber bead of the nose-cup. The stem of the nose-cup is in-

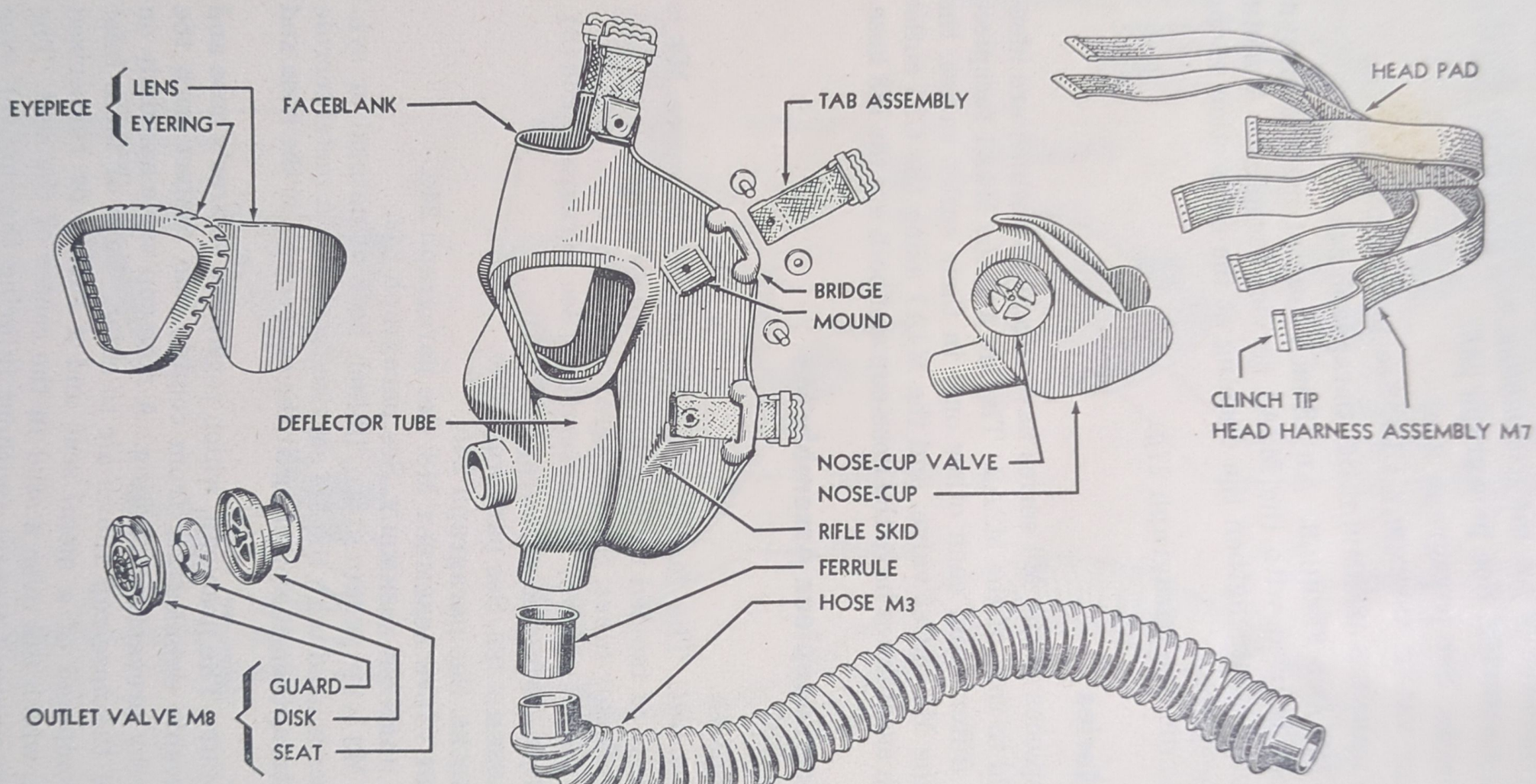


Figure 20. Service facepiece assembly M4.

serted through and folded back over the edge of the outlet valve nozzle and is held in place by the outlet valve. The nose-cup is further secured by vulcanizing or cementing it to the faceblank at the cheek position. Instead of the nose-cup being cemented or vulcanized to the faceblank, the lobe of the nose-cup and the tab assembly at cheek position of the faceblank may be fastened in place with a single rivet composed of a washer and a button.

31. Service Facepiece Assembly M4A1
(fig. 21)

a. FACEBLANK.

(1) *General.* The faceblank of the service facepiece M4A1 is made of molded rubber in small, universal, and large sizes.

(2) *Deflector tubes.* See paragraph 24*a*(2).

(3) *Attachments for tab assemblies.* See paragraph 24*a*(3).

(4) *Rifle skids.* See paragraph 24*a*(4).

b. TAB ASSEMBLIES. See paragraph 24*b*.

c. EYEPIECES. See paragraph 24*c*.

d. OUTLET VALVE ASSEMBLY C15. See paragraph 25*d*.

e. HEAD HARNESS ASSEMBLY. See paragraph 24*e*.

f. HOSE M3 AND FERRULE. An 18-inch hose of natural or synthetic rubber is used with the M4A1 service facepiece. A metal ferrule is used to strengthen the opening at the connection of the hose and facepiece.

g. NOSE-CUP. The nose-cup, which covers the wearer's nose and mouth, prevents exhaled air from coming into contact with the lenses, thereby preventing fogging. A nose-cup valve assembly on each side of the nose-cup allows air to enter. Each of these inlet valves is composed of a metal seat and a rubber or rubberized fabric disk, which fits over a stud in the center of the seat. The valve seat is crimped tightly (without injuring the rubber) over the rubber bead of the nose-cup. The stem of the nose-cup is inserted through and folded back over the edge of the outlet valve nozzle and is held in place by the outlet valve. The nose-cup is further secured by vulcanizing or cementing it to the faceblank at the cheek position. Instead of the nose-cup being cemented or vulcanized to the faceblank, the lobe of the nose-cup and the tab assembly at cheek position of the faceblank may be fastened in place with a single rivet composed of a washer and a button.

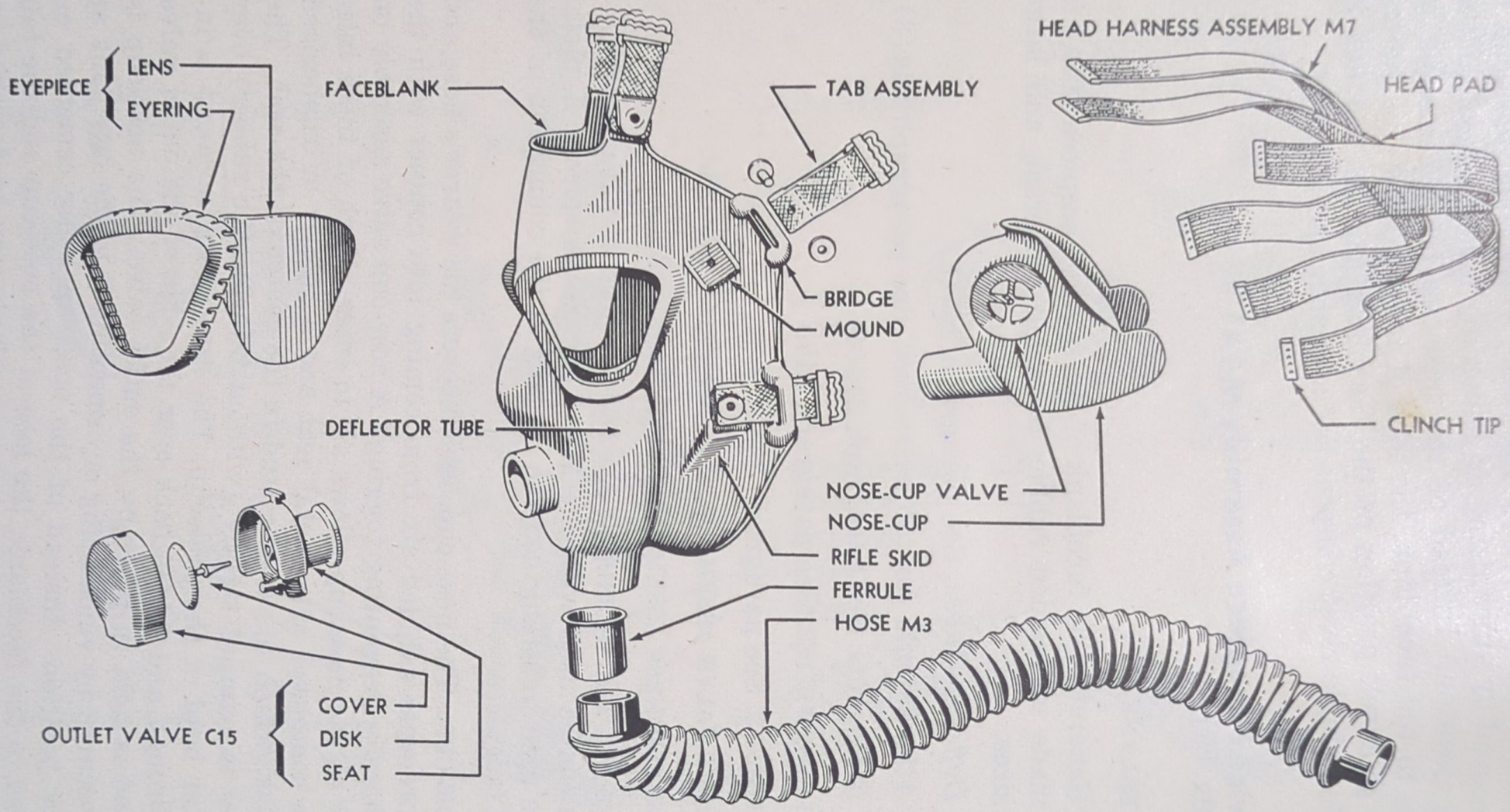


Figure 21. Service facepiece assembly M4A1.

32. Optical Facepiece Assembly M2
(fig. 22)

The distinguishing characteristics of the optical facepiece assembly M2 are the eyepieces and the diaphragm angletube assembly C11. (Although diaphragm angletube assembly C11 is standard nomenclature, in the field this assembly is referred to as diaphragm assembly.) The eyepieces are of high grade glass and are designed for use with binocular type optical instruments. The diaphragm portion is present to facilitate voice transmission. The assembly provides an outlet for exhaled air through a valve resembling the C15 outlet valve.

a. FACEBLANK.

(1) *General.* The faceblank of the optical facepiece M2 is made of molded rubber in small, universal, and large sizes.

(2) *Deflector tubes.* The deflector tubes, which cause incoming air to flow over the lenses to help prevent fogging, are integrally molded into the faceblank. They extend on each side of the faceblank from the hose stem at chin position to the outer sides of the apertures for the eyepieces.

(3) *Attachments for tab assemblies.* Six square rubber mounds and two rubber bridges to secure the tab assemblies are molded into the faceblank. Two mounds are located on projections at cheek positions, two mounds and two bridges are at temple positions, and two mounds are on projections at forehead positions.

b. TAB ASSEMBLIES. See paragraph 24*b*.

c. EYEPIECES. Two types of eyepiece assemblies are provided for the M2 optical facepiece—the screw-type assembly, and the slide-type assembly which is an alternate.

(1) *Screw-type eyepiece assembly* consists of two eyerings, two plate glass lenses, two adapters, a left and a right holder, and an adjusting screw. The lenses fit into the openings for the eyepieces, and the eyerings fit over the lenses and the rubber at the opening. The holders fit over the eyerings and are held in place by adapters screwed in place over the holders. The holders engage the adjusting screw, which has a right hand thread on one end, a left hand thread on the other. The distance between the lenses is adjusted by turning the knurled section of the screw so that eyepieces are drawn together or pushed apart as may be required. The flexible rubber at the bridge of the nose readily adjusts to this variation.

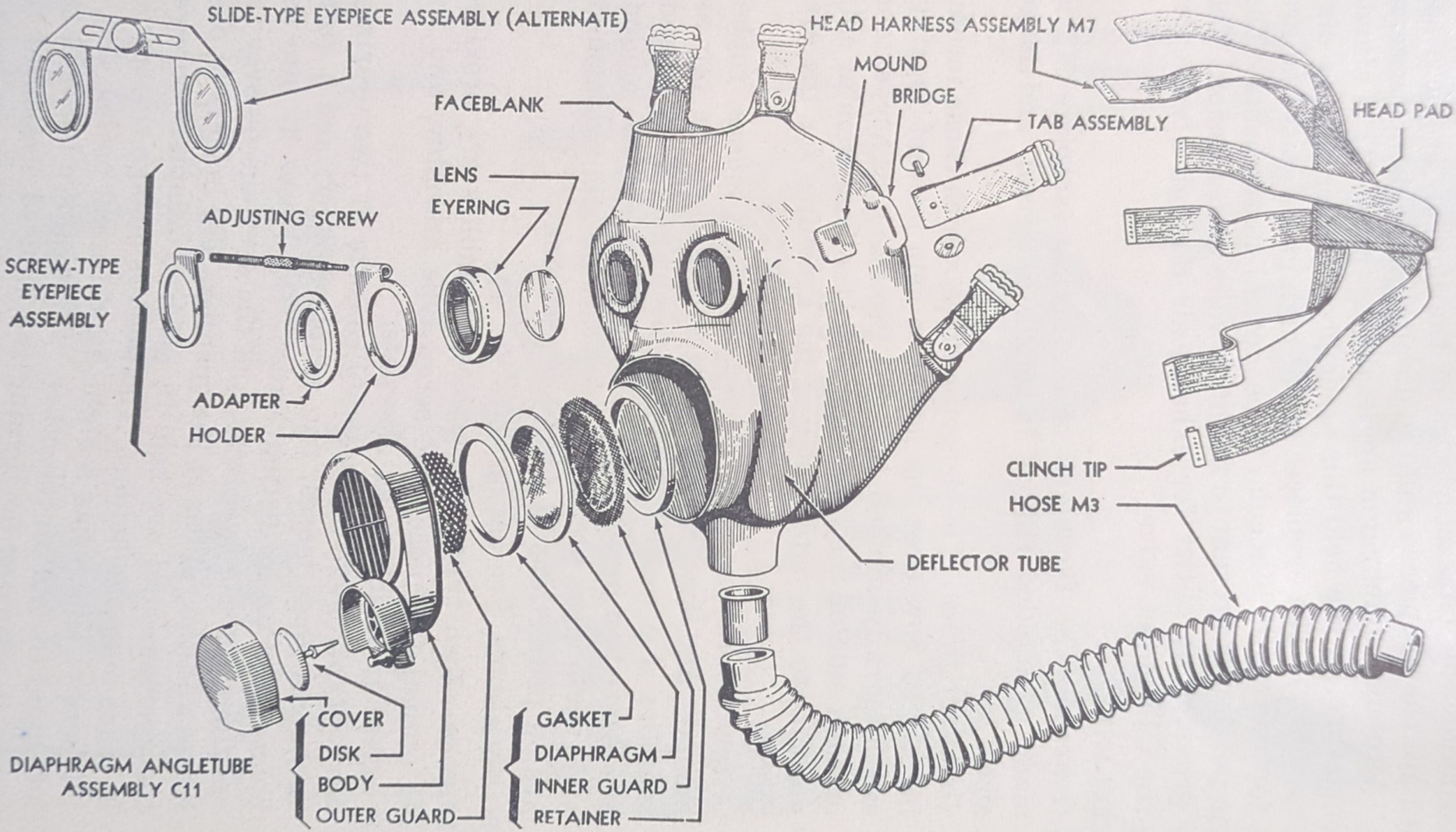


Figure 22. Optical facepiece assembly M2.

(2) *Slide-type eyepiece assembly* consists of two eyerings, two plate glass lenses, a left and a right holder, and a screw. Holders fit over the eyerings and are held in place by means of two lips. The two metal strips of the holders are made to overlap each other midway between the eyepieces. A compression screw holds them in any desired position.

d. DIAPHRAGM ANGLETUBE ASSEMBLY C11. This assembly, located below the eyepieces on the facepiece, is for the purpose of voice transmission as well as to provide an outlet for exhaled air and prevent contaminated air from entering the mask. Components of the diaphragm angletube assembly are as follows:

(1) *Body.* The body comprises the metal die-cast frame, which protects the diaphragm and to which the outlet valve disk and cover are attached. Upper portion of the body has a circular grillwork. Below this grillwork is the outlet valve seat to which the outlet valve disk is attached. In the center of the face of the seat is a hub supported by six radial spokes. A semicircular canopy at the top of the seat insures free action of the disk. A stud at the bottom aids in proper seating and retention of the cover.

(2) *Outlet valve disk.* The molded rubber disk has a stem which is inserted into the center hub of the outlet valve seat, allowing the truncated conical periphery of the disk to lie against a raised circular lip of the seat.

(3) *Outlet valve cover.* A cover of molded rubber fits over the seat, protecting the disk. Two air outlet openings are provided at the bottom. The inside of the cover is roughened to facilitate deicing of the assembly. Sticking valves are freed by pressing and moving the roughened surface against the valve surface.

(4) *Diaphragm assembly and related parts.* The diaphragm assembly consists of a diaphragm of butyl rubber-coated fabric cemented to a metal spacer. On one side of this assembly is an outer guard of woven wire mesh cloth and a rubber gasket; on the side next to the spacer is an inner guard of woven wire mesh cloth. A threaded metal retainer holds the components in position.

e. HEAD HARNESS ASSEMBLY. See paragraph 24*e*.

f. HOSE M3 AND FERRULE. An 18-inch hose of natural or synthetic rubber is used with the M2 optical facepiece. A metal ferrule is used to strengthen the opening at the connection of the hose and facepiece.

33. Snout-Type Facepiece Assembly M8
(fig. 23)

Distinguishing characteristic of the snout-type facepiece assembly M8 is the presence of the canister mounting adapter assembly directly at the bottom of the faceblank in the position where the hose would ordinarily be attached. There is no hose with the snout-type facepiece. The faceblank is identical to those used for the M2A3, M3, and M3A1 facepiece assemblies. The C15 outlet valve and the C4 head harness are used. A nose-cup is also used. The snout-type facepiece assembly M8 (alternate) differs only in that it uses the faceblank with mounds and rifle skids at cheek positions and has modified neck strap and stud tab assemblies (par. 34).

a. FACEBLANK.

(1) *General.* Faceblank of the M8 facepiece is made of molded rubber in small, universal, and large sizes.

(2) *Deflector tubes.* See paragraph 24*a*(2).

(3) *Attachments for tab assemblies.* See paragraph 25*a*(3).

b. TAB ASSEMBLIES. The six cotton webbing tab assemblies, with buckles attached, are used to fasten and adjust the head harness. Assemblies are riveted to the mounds of the faceblank, two at cheek positions, two at temple positions, and two at forehead positions. The one at left cheek position has the neck strap attached. The one at right cheek position is called a stud tab assembly, and has a fastener stud which engages the socket on the fastener tab assembly of the neck strap assembly.

c. EYEPIECES. The eyepieces consist of plastic or laminated glass lenses and metal eyerings. Eyerings are crimped to the rubber surrounding the lenses.

d. OUTLET VALVE ASSEMBLY C15. See paragraph 25*d*.

e. NOSE-CUPS. See paragraph 27*g*.

f. CANISTER MOUNTING ADAPTER ASSEMBLY. This assembly, into which the canister fits, includes the body assembly, a rubber gasket, and the seat assembly. The body assembly, made of aluminum alloy, consists of a tube attached at an angle to the body. The tube fits into the hose stem of the facepiece. The seat assembly, consisting of an aluminum alloy seat, a rubber inlet valve disk, and a snap fastener assembly, fits into the body assembly and is held in place by the rubber gasket. The face of the seat has six radial spokes; the valve disk lies against the inside surface of these spokes and is held in place by the snap fastener assembly.

g. HEAD HARNESS C4 AND NECK STRAP ASSEMBLIES.

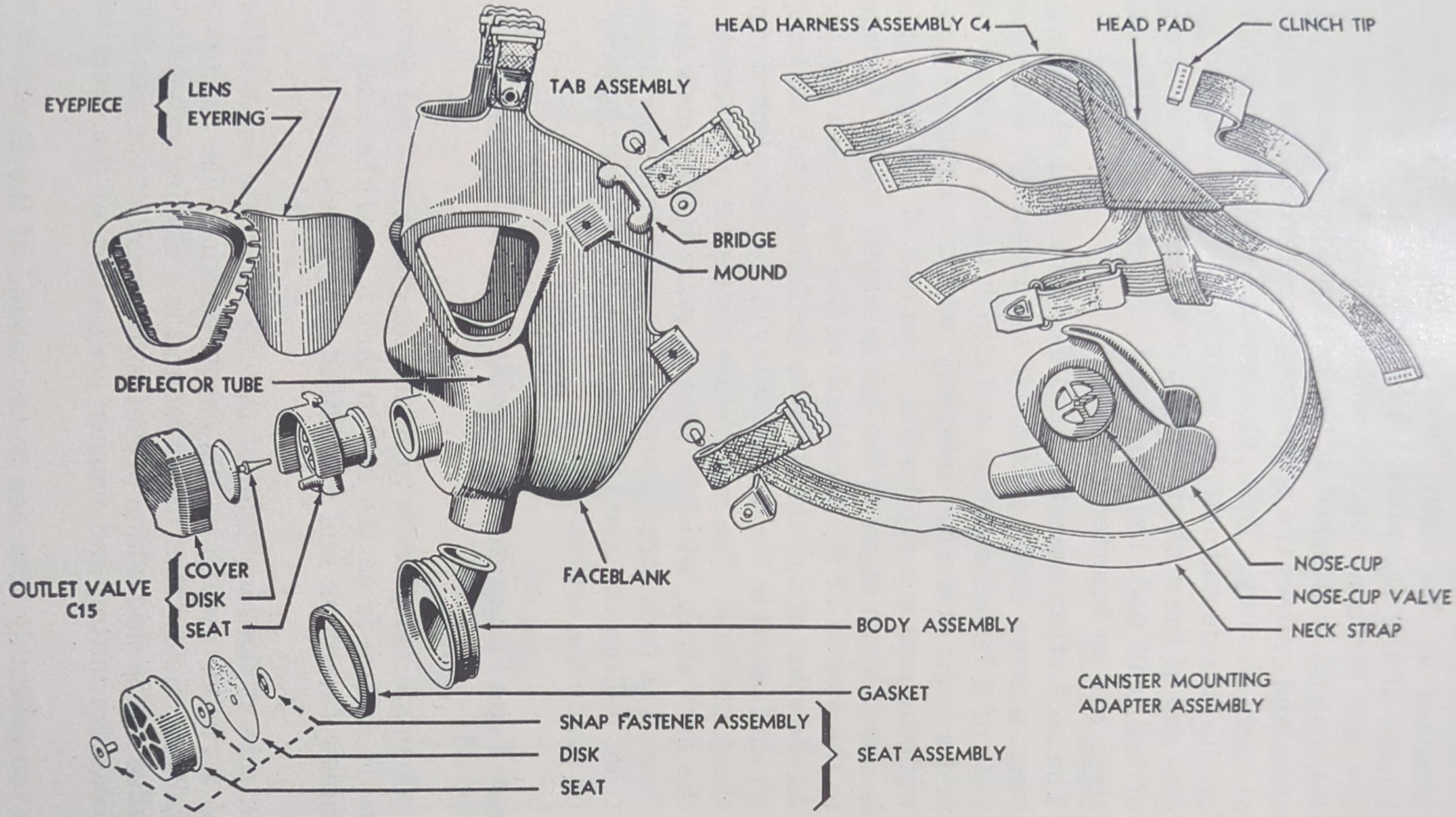


Figure 23. Snout-type facepiece assembly M8.

(1) The C4 head harness assembly consists of three crossed straps of 7/8-inch webbing, with clinch tips on the end to prevent raveling, and a neck strap loop. One strap is attached at the right forehead buckle and left cheek buckle of the facepiece. A second strap is attached at the left forehead buckle and right cheek buckle. The third strap is attached at the two buckles at temple positions and crosses the other two straps which are stitched at each crossing. This junction has impermeable fabric applied inside and outside, to form a triangular head pad. One end of the neck strap loop is sewed to the lower edge of the head pad; the other end is free so that the neck strap can be inserted through it.

(2) The neck strap assembly includes a strap of elastic webbing; a strap slide; a fastener tab assembly, which consists of a fastener socket and clinch plate, a leather tab, and a loop; and a tab assembly, which consists of cotton webbing and a strap buckle. One end of the neck strap is sewed at an angle to the tab assembly which is riveted to the mound of the faceblank at the left cheek position. At the other end of the strap is the fastener tab assembly, which fastens to the tab assembly of the facepiece at right cheek position. The metal slide allows for adjustment of the neck strap, which is held in place by the neck strap loop. The neck strap prevents the weight of the canister from pulling the mask to one side, or from displacing it by pendulum action.

34. Snout-Type Facepiece Assembly M8 (Alternate) (fig. 24)

An M8 alternate facepiece is provided for the snout-type service gas mask. It differs from the M8 in that it uses the older type molded rubber faceblank and a modified neck strap and stud tab assembly.

a. Each side of the faceblank of the M8 alternate has a bridge as well as a rubber mound at the cheek position, like the one at temple position. Below the rubber mound is a sloping rubber projection called a rifle skid which prevents the recoil of the rifle from tearing loose the button and washer connection of the cheek tab assembly.

b. The tab assembly attached to the mound of the faceblank at left cheek position is a part of the neck strap assembly. Tab assembly is slightly longer than that of the M8. The neck strap of the M8 alternate is placed under the tab assembly and sewed in place

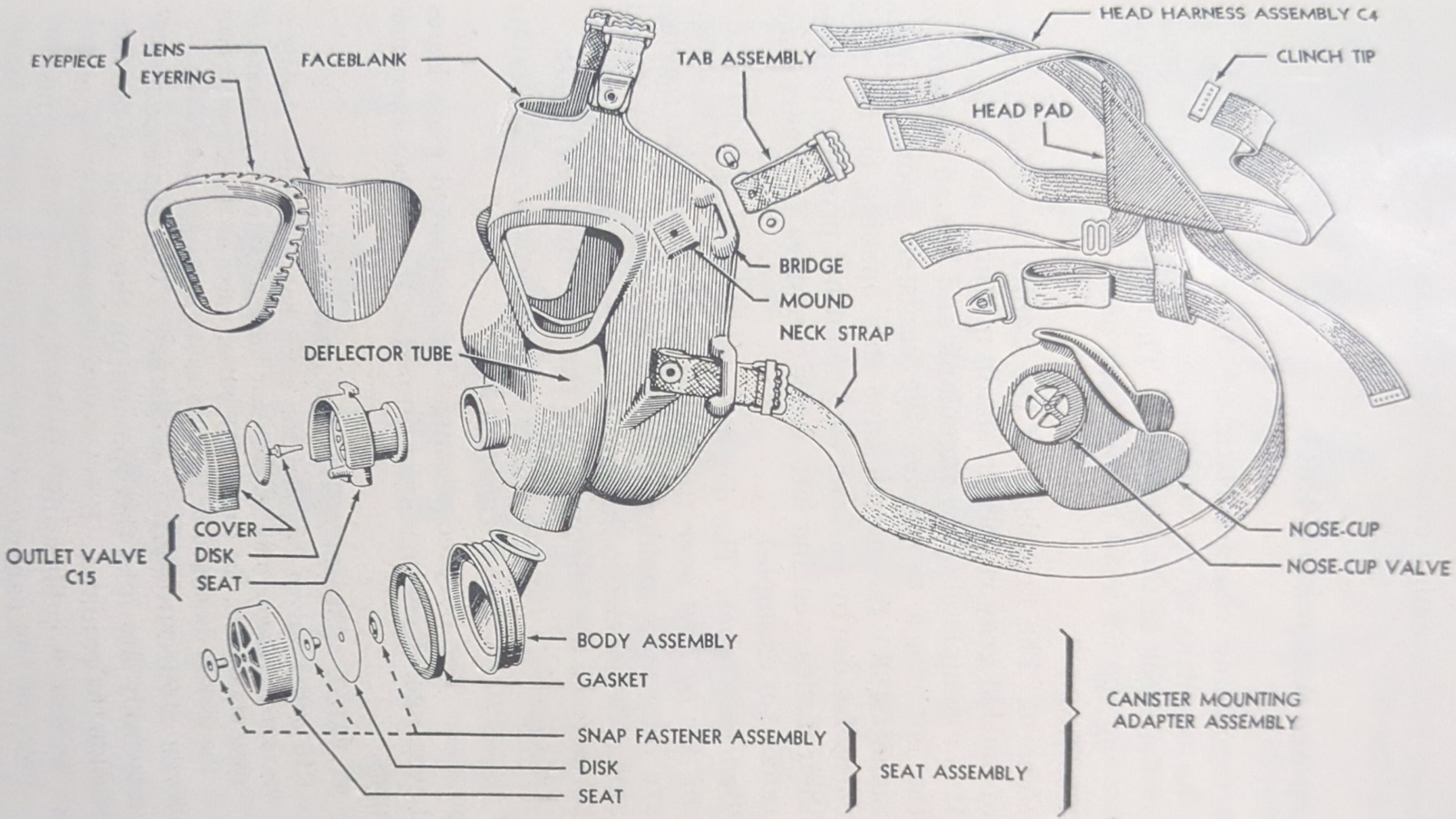


Figure 24. Snout-type facepiece assembly M8 (alternate)

so that both may be inserted under the bridge of the faceblank, while on the M8, the neck strap is sewed at an angle to the tab assembly.

c. The stud tab assembly of the M8 alternate is slightly longer than that of the M8.

35. Facepiece Assembly C48R1
(fig. 25)

The distinguishing characteristic of the C48R1 facepiece assembly is the mounting of the canister directly to a canister mounting piece in the cheek of the faceblank. There is no hose. The C15 outlet valve and the C8 head harness are used.

a. FACEBLANK.

(1) *General.* The faceblank of the C48R1 facepiece is made of molded gray rubber in small, medium, and large sizes. It is a completely new faceblank and has an aperture on the left cheek to receive the canister mounting piece. Some C48R1 facepieces have this opening on the right cheek for use by persons who could not properly perform their duties wearing left-cheek canisters (gunners inside tanks, for example).

(2) *Deflector tubes.* The deflector tubes, which cause incoming air to flow over the lenses to help prevent fogging, are integrally molded into the faceblank. They extend along the cheeks to the eyepieces. Air enters the deflector tubes from the inlet valve on the left (or right) cheek.

(3) *Attachments for tab assemblies.* See paragraph 25*a*(3).

b. TAB ASSEMBLIES. See paragraph 33*b*.

c. EYEPIECES. The eyepieces consist of laminated glass lenses and metal eyerings. Eyerings are crimped to the rubber surrounding the lenses.

d. OUTLET VALVE ASSEMBLY C15. See paragraph 25*d*.

Note. All C15 outlet valves function the same but may differ slightly in outward appearance. (Cover may or may not have a tab on it.) Because of rigid leakproofing standards, the entire C15 outlet valve of the M9 mask must be replaced if the disk is damaged or lost; no spare disks are authorized.

e. CANISTER MOUNTING PIECE ASSEMBLY. The canister mounting piece assembly fits into the opening on the cheek of the faceblank and holds the canister. It is composed of the canister mounting piece, a gasket, a rubber inlet valve disk, and a snap fastener assembly. Face of the canister mounting piece is slightly convex with six radial spokes. The inlet valve disk fits into the concave portion on the rear side and is held in place by the snap fastener assembly.

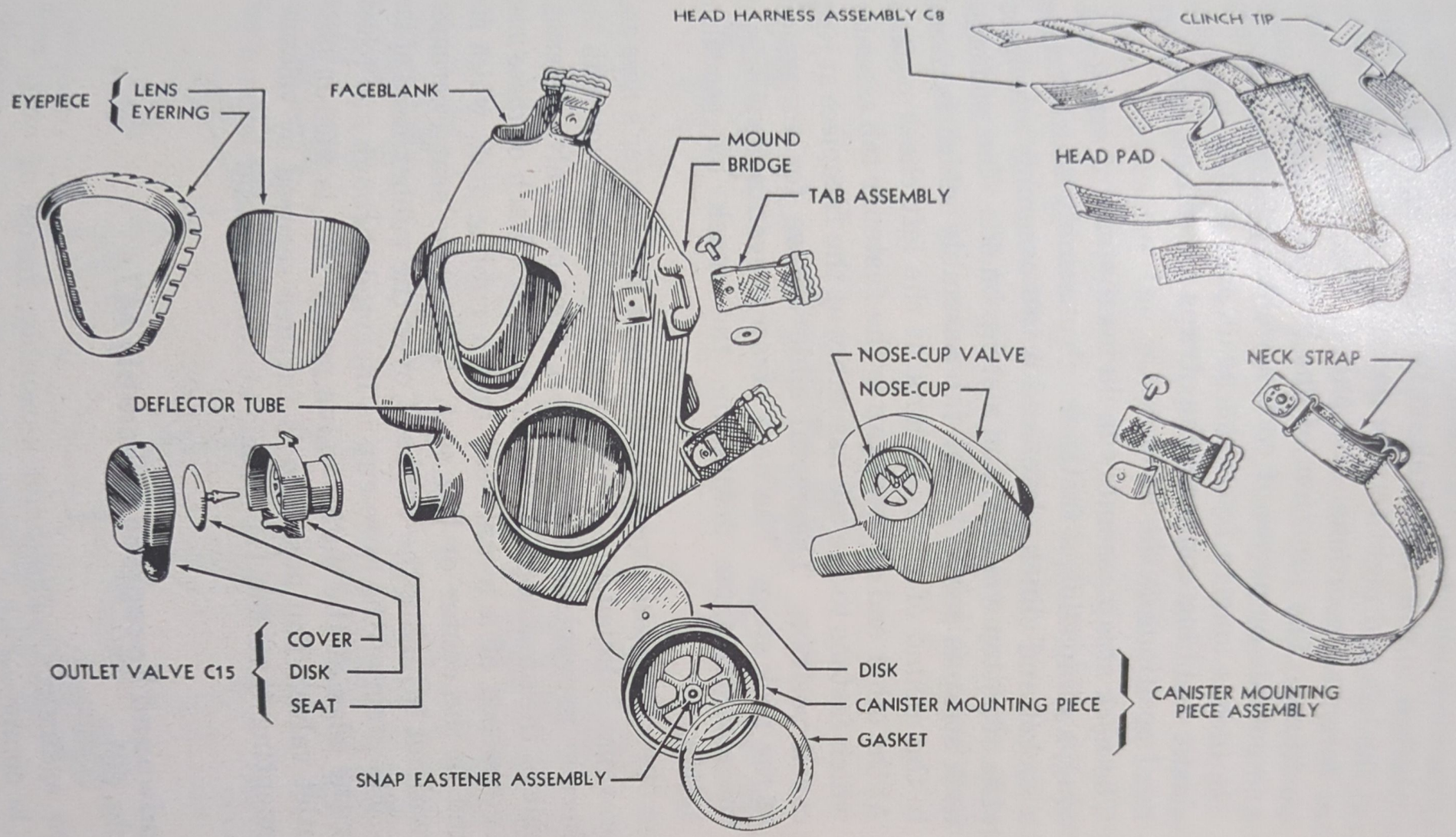


Figure 25. Facepiece assembly C48R1.

f. HEAD HARNESS ASSEMBLY C8 AND NECK STRAP ASSEMBLY.

(1) The C8 head harness assembly consists of five straps of 7/8-inch elastic webbing, with clinch tips on the ends to prevent raveling, and a rectangular head pad. Straps are attached to the faceblank as follows: one to the buckles at the left and right temple positions, one each to buckles at forehead positions, and one each to buckles at cheek positions. The junction of the straps is covered inside and outside by pieces of cotton webbing 2 inches wide by 3 3/8 inches long to form the head pad. A 3-inch piece of elastic webbing connects the straps extending from forehead positions to the head pad.

(2) The neck strap assembly includes a strap of elastic webbing, a strap slide, a fastener tab assembly which includes a socket and clinch plate, and a tab assembly which consists of cotton webbing and a strap buckle. One end of the neck strap is sewed to the tab assembly which is riveted to the mound of the faceblank at the left cheek position. At the other end of the strap is the fastener tab assembly, which fastens to the tab assembly of the facepiece at right cheek position. The metal slide allows for adjustment of the neck strap. The neck strap prevents the weight of the canister from displacing the mask by pendulum action.

g. NOSE-CUP. The nose-cup, which covers the wearer's nose and mouth, prevents exhaled air from coming into contact with the lenses, thereby preventing fogging. A nose-cup valve assembly on each side of the nose-cup allows air to enter. Each of these inlet valves is composed of a metal seat and a rubber disk, which fits over a stud in the center of the seat. The valve seat is crimped tightly (without injuring the rubber) over the rubber head of the nose-cup. The stem of the nose-cup is inserted through and folded back over the edge of the outlet valve nozzle and is held in place by the outlet valve. The nose-cup is further secured by vulcanizing or cementing it to the faceblank at the chin and lower cheek positions.

36. Headwound Facepiece Assembly M7
(fig. 26)

a. HOOD ASSEMBLY. The hood assembly, made of vinyl resin sheeting, is composed of a front assembly and a back assembly, heat-sealed at the seams to form one piece. The top is rounded to take the shape of the head, and the bottom opens out to fit the neck and chest. At the top center of the front is the eyepiece, rectangu-

lar in shape with rounded ends. It is made of plate-polished vinyl resin sheeting and is heat-sealed in place over the eye opening in the hood. Directly below the eyepiece is the canister mounting piece opening, which has a reinforcing disk heat-sealed around edges of opening. Above and to the left of this opening is the outlet valve opening, which also has a reinforcing disk heat-sealed around the edges. Four buckle holders made of vinyl resin sheeting are heat-sealed to the front—two at the top and one on each side of the hood at the level of the eyepiece—for the purpose of attaching the strap assemblies. Four strap assemblies, made of 13/16-inch webbing with buckles attached, are fastened to the buckle holders for the purpose of obtaining a gastight seal. A buckle strap, heat-sealed to the center of the lower front of the hood, has a strap assembly of 13/16-inch webbing attached for the purpose of tying mask close to the patient's neck. At the center top of the back is a buckle strap made of vinyl resin sheeting, used for securing the strap assemblies when fitting mask over patient's head.

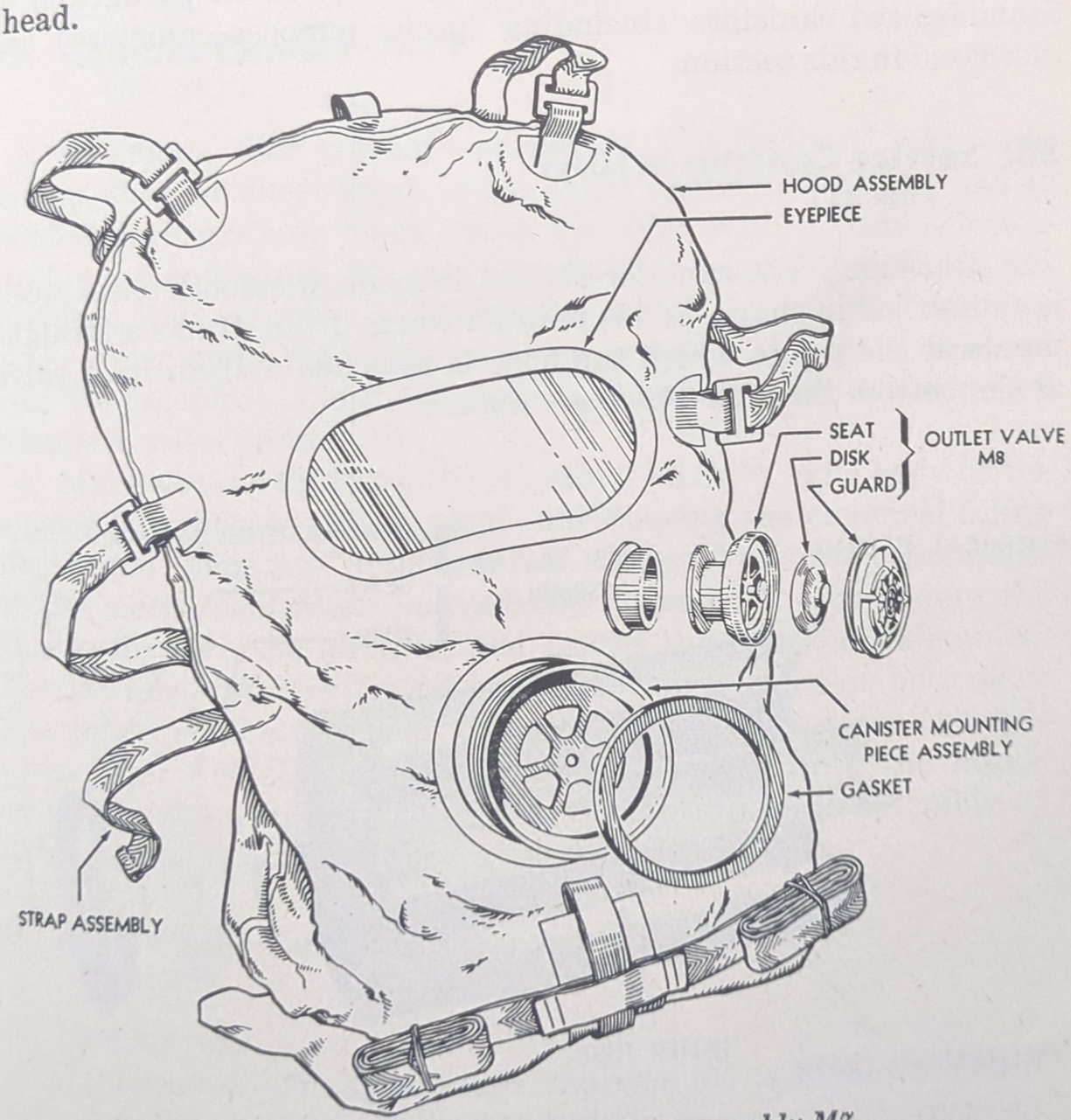


Figure 26. Headwound facepiece assembly M7.

b. CANISTER MOUNTING PIECE. The canister mounting piece, which engages the canister, fits into the opening in the center front of the hood assembly. Face of the mounting piece is slightly convex with six radial spokes. The usual rubber inlet valve disk and snap fastener assembly are not included in this piece.

c. OUTLET VALVE ASSEMBLY M8. See paragraph 24*d*.

Section II. CANISTERS

37. General

Although military canisters appear in several different types, the basic functioning of each is the same. The canister is essentially an air filter which adsorbs and/or neutralizes the toxic gases and particles in the air, allowing purified air to pass through. The specific functioning of the canister is discussed in paragraph 6. Standardized canisters (including special purpose canisters) are discussed in this section.

38. Service Canister M10A1
(fig. 27)

a. GENERAL. The canister M10A1 is made of smooth sheet steel, is cylindrical in shape, and is painted warm drab. It has a straight nozzle at the top to which the hose is attached and an inlet valve at the bottom through which air enters.

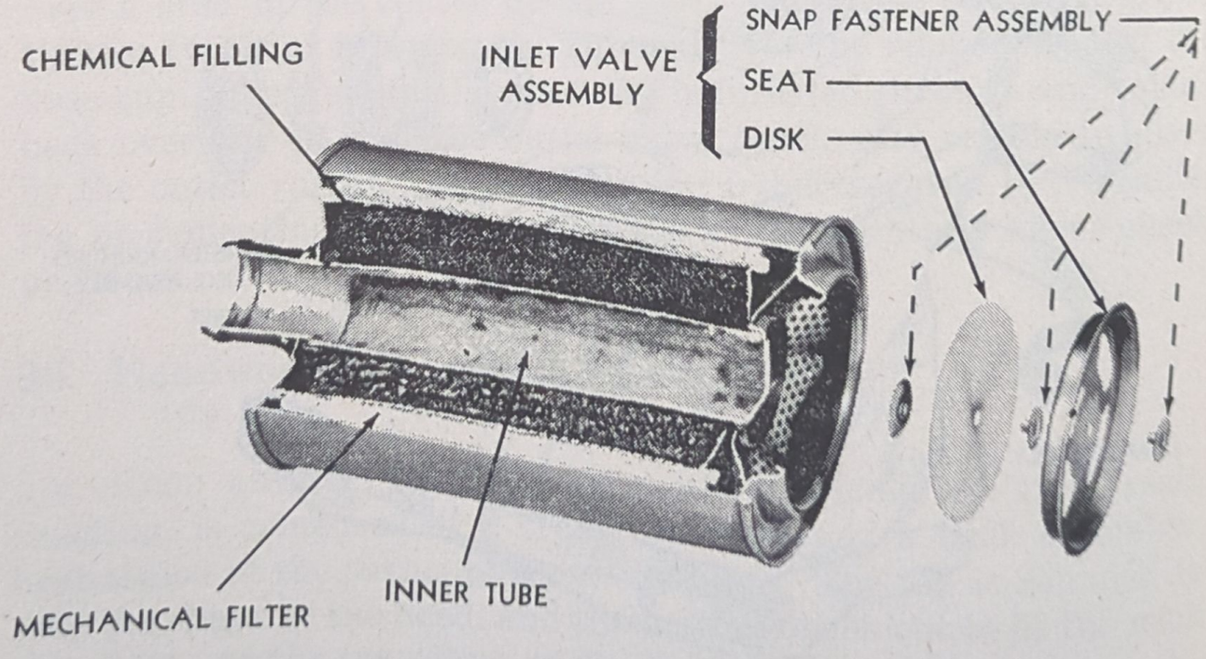


Figure 27. Service canister M10A1.

b. MECHANICAL FILTER AND CHEMICAL FILLING. Mechanical filter and chemical filling are located inside the canister body and are supported at the bottom of the canister by a perforated steel spacer. Air passes through the mechanical filter, which consists of layers of filter material, then through the chemical filling of activated (type ASC impregnated) charcoal which is encased in a perforated metal container. (Some charcoal may give off an ammoniacal odor, but will cause no harmful effects.) The air then flows into the center of the container, which is a tube lined with a thin layer of felt to restrain the charcoal dust. The purified air flows through the inner tube and out the nozzle at the top of the canister. See figure 5 for airflow chart.

c. INLET VALVE. The inlet valve, located at the bottom of the canister, is composed of an inlet valve seat assembly and a rubber disk. This valve permits air to travel into the canister when the wearer inhales, but prevents flow of air out of the canister when the wearer exhales.

39. Combat Canister M11
(fig. 28)

a. GENERAL. The combat canister M11 is made of sheet aluminum alloy or sheet steel, has a squat cylindrical shape, and is painted dark gray or black. It is provided with a metal closure cap for the end which fits into the canister mounting piece of the facepiece, and a rubber air inlet plug which fits into the opening on the other end. When the canister is not in use, it is removed from the facepiece, and the closure cap and inlet plug are attached to make it waterproof.

b. MECHANICAL FILTER AND CHEMICAL FILLING. The body of the canister is composed of two parts, one housing the chemical filling of activated (type ASC impregnated) charcoal and the other housing the mechanical filter (aerosol filter element). Air enters the canister through the air inlet and passes through the mechanical filter, the fines retainer (consisting of cotton covered on both sides by scrim), and the chemical filling. The air then passes through a fines filter (of scrim-covered cotton), and on into the nozzle and to the inlet valve of the canister mounting piece assembly of the facepiece. See figure 5 for airflow chart.

40. Acid Vapor Canister MI
(fig. 29)

a. DESCRIPTION.

(1) *General.* The acid vapor canister MI is made of corrugated sheet metal, is rectangular in shape with rounded

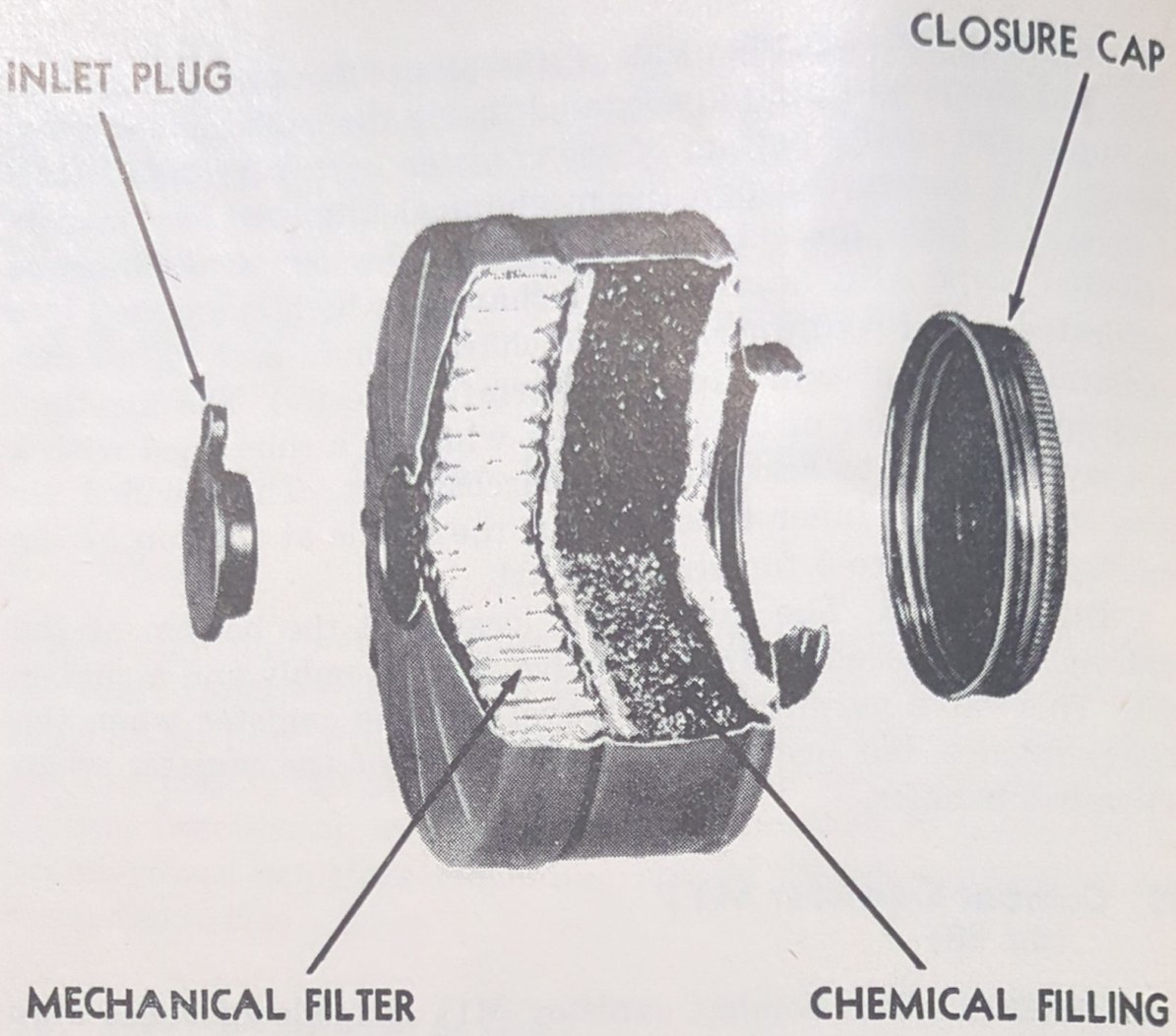
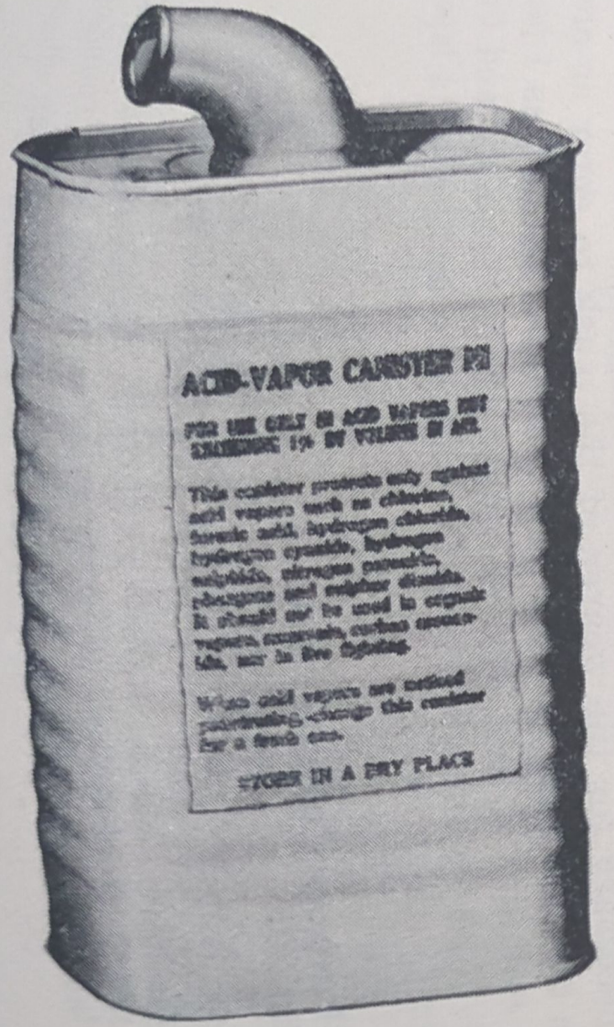


Figure 28. Canister M11.

lateral edges, and is painted white. At the top is an elbow nozzle, stoppered with a cork when not attached to the hose of the mask; at the bottom is an inlet valve. A label with instructions for use of the canister is pasted on one side.

(2) *Chemical filling.* In the bottom of the canister body is a perforated sheet metal dome which supports the chemical filling of soda lime granules and permits air to flow through. Above the soda lime, which is an absorbent for acid vapors, is a dust filter consisting of two layers of wire cloth with a cotton filter pad between the layers. Pushing down on the dust filter is a spiral spring, retained by the top of the canister. This spring holds the filling in place. Air enters the bottom of the canister through the inlet valve and flows axially through the bed of soda lime and the dust filter, through the elbow nozzle at the top, and into the hose.

(3) *Inlet valve.* The inlet valve, located at the bottom of the canister, is composed of an inlet valve seat assembly and a rubber disk. This valve permits air to travel into the



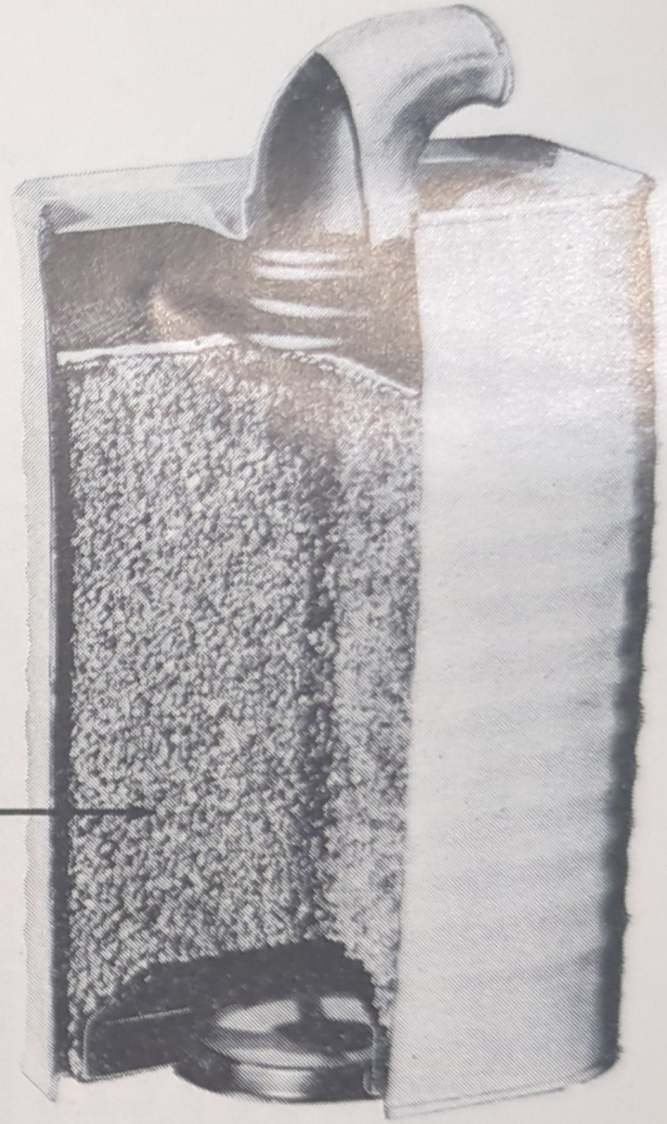


Figure 29. Acid vapor canister MI (white).

canister when the wearer inhales, but prevents flow of air out of the canister when the wearer exhales.

b. CHEMICALS PROTECTED AGAINST. The acid vapor canister protects against all acid vapors, such as—

Acetic acid
Chlorine
Cyanogen chloride (use of HCN canister advised)
Formic acid
Hydrogen chloride
Hydrogen cyanide (use of HCN canister advised)
Hydrogen sulfide
Nitrogen peroxide
Phosgene
Sulfur dioxide

c. LIMITATIONS. No protection is afforded by this canister against organic vapors such as acetone, alcohols, aniline, benzene, carbon bisulfide, carbon tetrachloride, chloroform, chloropicrin, ether, ethylene dichloride, formaldehyde, gasoline and other petroleum distillates, and toluene. This canister gives no protection against ammonia gas, which is often found around refrigeration plants. Neither does it restrain carbon monoxide, which may result from fires in inclosed spaces or from leaking gas mains.

d. WARNINGS OF APPROACHING SATURATION. When the canister approaches saturation, a slow but gradually increasing leakage of vapors takes place, and the odor of most of these vapors warns the wearer that the canister must be replaced. With some acid gases, skin irritation warns of excessive concentrations, which must be dispelled by ventilation or water spray. Concentrations of hydrogen cyanide as high as 2 percent do not irritate the skin, although enough may be absorbed through the skin at this concentration to overcome a man in about 10 minutes. In fumigating buildings and ships, much lower concentrations are used. If it becomes necessary for the wearer of the mask to enter an area where the concentration of hydrogen cyanide is as high as 1 percent, the exposure should not be longer than 1 minute and the same individual should not repeat the exposure until after a lapse of 24 hours.

41. All-Purpose Canister MI
(fig. 30)

a. DESCRIPTION.

(1) *General.* The all-purpose canister MI is made of corrugated sheet metal, is rectangular in shape with rounded lateral edges, and is painted red. At the top is an elbow

nozzle which is stoppered with a cork when not attached to the hose of the mask; at the bottom is an inlet valve. A label surrounds the canister. It has instructions for use of the canister, manufacturing date, and a space on which to record the time in minutes that the mask is worn.

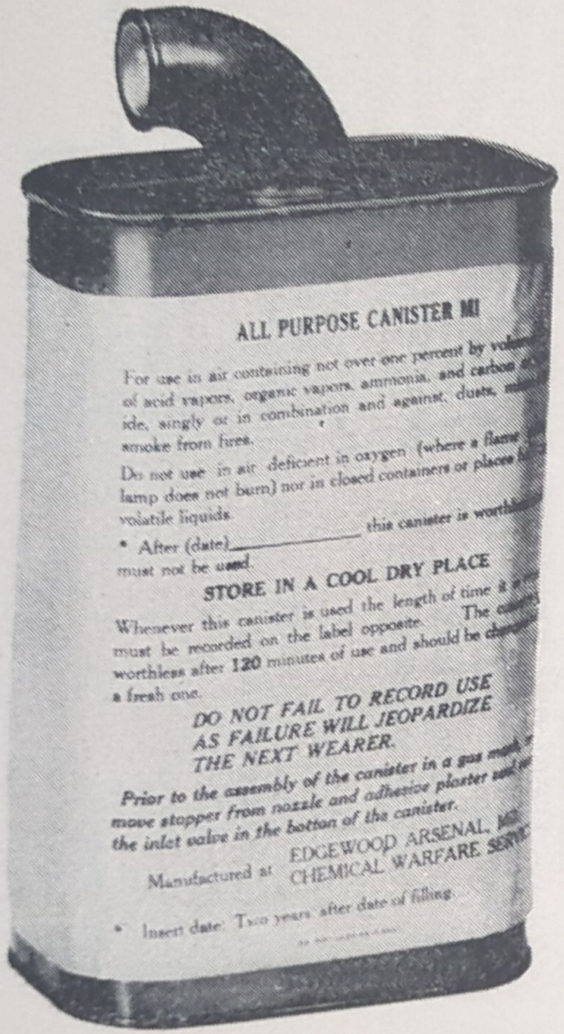
(2) *Chemical filling.* In the bottom of the canister body is a perforated sheet metal dome which supports the five layers of chemical filling. Beginning at the bottom, the layers are: activated charcoal, silica gel, caustic pumice, hopcalite, and caustic pumice. The charcoal and silica gel are separated by wire screens containing a filter pad. The other layers are separated by wire screens. Above the chemical filling is a follower assembly consisting of two layers of wire cloth with a pad between the two layers to filter out dust and smoke. Pushing down on the follower assembly is a spiral spring, which is retained by the canister top. This spring holds the filling in fixed position. Air enters the bottom of the canister through the inlet valve and flows axially through the chemical filling and the filters, through the elbow nozzle at the top, and into the hose.

(3) *Inlet valve.* The inlet valve, located at the bottom of the canister, is composed of an inlet valve seat assembly and a rubber disk. This valve permits air to travel into the canister when the wearer inhales, but prevents flow of air out of the canister when the wearer exhales.

b. CHEMICALS PROTECTED AGAINST.

(1) The all-purpose canister protects against carbon monoxide, ammonia, and acid and organic vapors such as—

Acid vapors	*Organic vapors*
Acetic acid	Acetone
Chlorine	Alcohols
Cyanogen chloride (use of HCN canister advised)	Anilines
Formic acid	Benzene
Hydrogen chloride	Carbon bisulfide
Hydrogen cyanide (use of HCN canister advised)	Carbon tetrachloride
Hydrogen sulfide	Chloroform
Nitrogen peroxide	Chloropicrin
Phosgene	Ethers
Sulfur dioxide	Ethylene dichloride
	Formaldehyde
	Gasoline (and other petroleum derivatives)
	Toluene



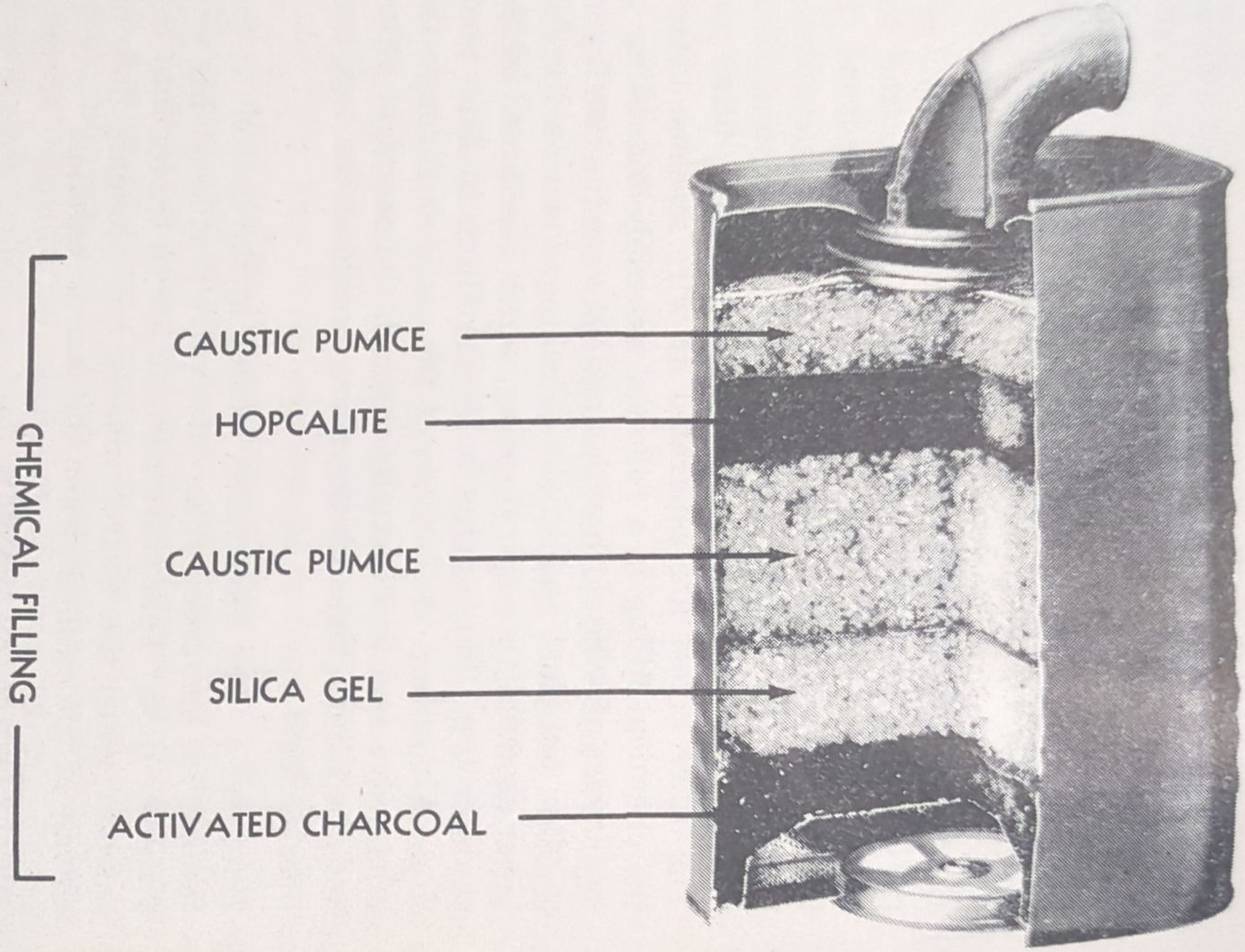


Figure 30. All-purpose canister MI (red).

(2) The all-purpose canister will probably protect against many other chemicals, including acetylene, cyclohexanone, kerosene, methyl bromide, paint, turpentine, and xylene.

c. EXTENT OF PROTECTION. Gas concentrations are restrained satisfactorily up to 1 percent by volume, whether of an individual toxic gas or a combination of gases. Concentrations of hydrogen cyanide as high as 1 percent are very unusual, but, if encountered, exposure should be limited to less than a minute at a time, not only to reduce canister penetration but to prevent dangerous skin absorption. For hydrogen cyanide, the use of the HCN canister is advised. With most of the other gases, gradual leakage of irritating vapors will warn the wearer when the canister must be replaced or, in some cases, irritation of the skin will indicate that the concentration must be reduced.

d. TIME LIMIT. Since carbon monoxide may be present in a gas concentration without the wearer of the mask being aware of the fact, and since canisters are considered unsafe for use after a limited exposure to carbon monoxide, canisters must be discarded after 120 minutes of use, whether or not carbon monoxide is believed to have been encountered. The time of use must be recorded in minutes for each interval that the mask is worn. Also, the canister must not be used after 2 years from date of manufacture marked on the label.

e. OXYGEN DEFICIENCY. Carbon monoxide is often a constituent of ordinary commercial gas and is often present in products of combustion (especially if the fire is burning in an inclosed space with insufficient air) or in the exhaust of an engine. In areas where carbon monoxide may be present, there is also a possible deficiency of oxygen in the air. Lack of oxygen renders the use of any canister unsafe; canisters do not manufacture oxygen but only purify contaminated air.

42. Oil Vapor Canister MI (fig. 31)

a. DESCRIPTION.

(1) *General.* The oil vapor canister MI is made of corrugated sheet metal, is rectangular in shape with rounded lateral edges, is painted black, and has a white label. At the top of the canister is an elbow nozzle, stoppered with a cork when not attached to the hose of the mask; at the bottom is an inlet valve.

(2) *Chemical filling.* In the bottom of the canister is a perforated sheet metal dome which supports the filling of

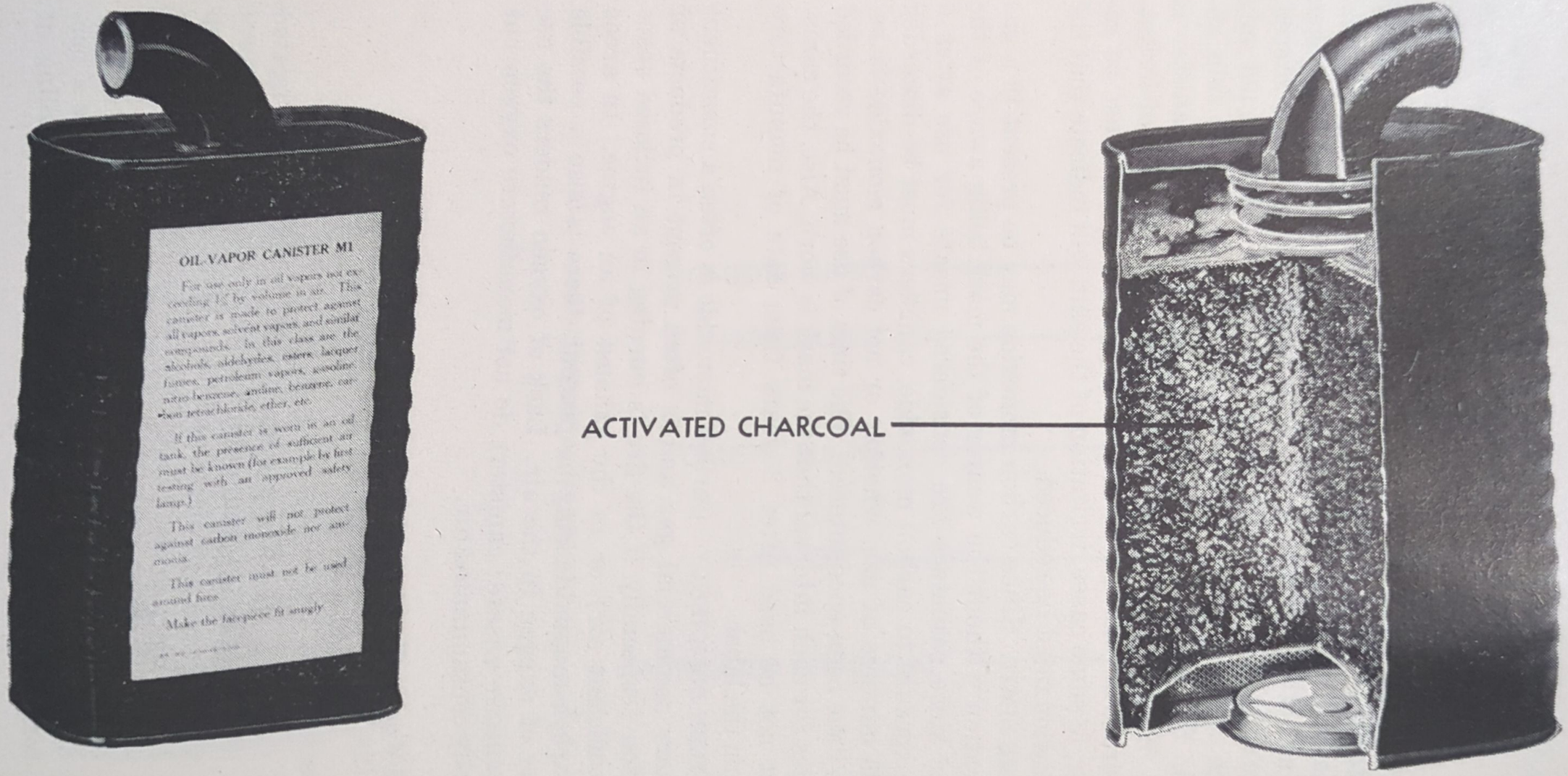


Figure 31. Oil vapor canister MI (black).

activated charcoal and permits air to flow through it. Above the charcoal is a dust filter consisting of two layers of wire cloth with a pad of cotton wadding between the layers. Pushing down on the dust filter is a steel spring to hold the filling in place. The spring is retained by the top of the canister. Air enters the bottom of the canister through the inlet valve and flows through the charcoal, the dust filter, the elbow nozzle at the top, and into the hose.

(3) *Inlet valve.* The inlet valve, located at the bottom of the canister, consists of an inlet valve seat assembly and a rubber disk. This valve permits air to travel into the canister when the wearer inhales, but prevents flow of air out of the canister when the wearer exhales.

b. CHEMICALS PROTECTED AGAINST. This canister protects against alcohols, aldehydes, anilines, benzene, carbon tetrachloride, esters, ethers, gasoline, lacquer and paint fumes, nitrobenzene, and petroleum vapors. The oil vapor canister will probably protect against acetylene and benzyl benzoate.

c. LIMITATIONS. The oil vapor canister is for use only in oil vapor concentrations not exceeding 1 percent by volume in air. It will not protect against carbon monoxide or ammonia. It must not be used around fires.

43. Ammonia Canister M2
(fig. 32)

a. DESCRIPTION.

(1) *General.* The ammonia canister M2 is made of corrugated sheet metal, is rectangular in shape with rounded lateral edges, and is painted green. At the top is an elbow nozzle, stoppered with a cork when not attached to the hose of the mask; at the bottom is an inlet valve. A label with instructions for use of the canister is pasted on one side.

(2) *Chemical filling.* In the bottom of the canister body is a preforated sheet metal dome which supports the filling of silica gel particles and permits air to flow through the filling. Above the filling is an assembly consisting of two layers of wire cloth with a pad between to filter out dust. Pushing down on the dust filter is a rectangular-shaped spring, retained by the canister top. This spring holds the filling in position. Air enters the bottom of the canister through the inlet valve and flows axially through the chemical filling, the dust filter, the elbow nozzle at the top, and into the hose.

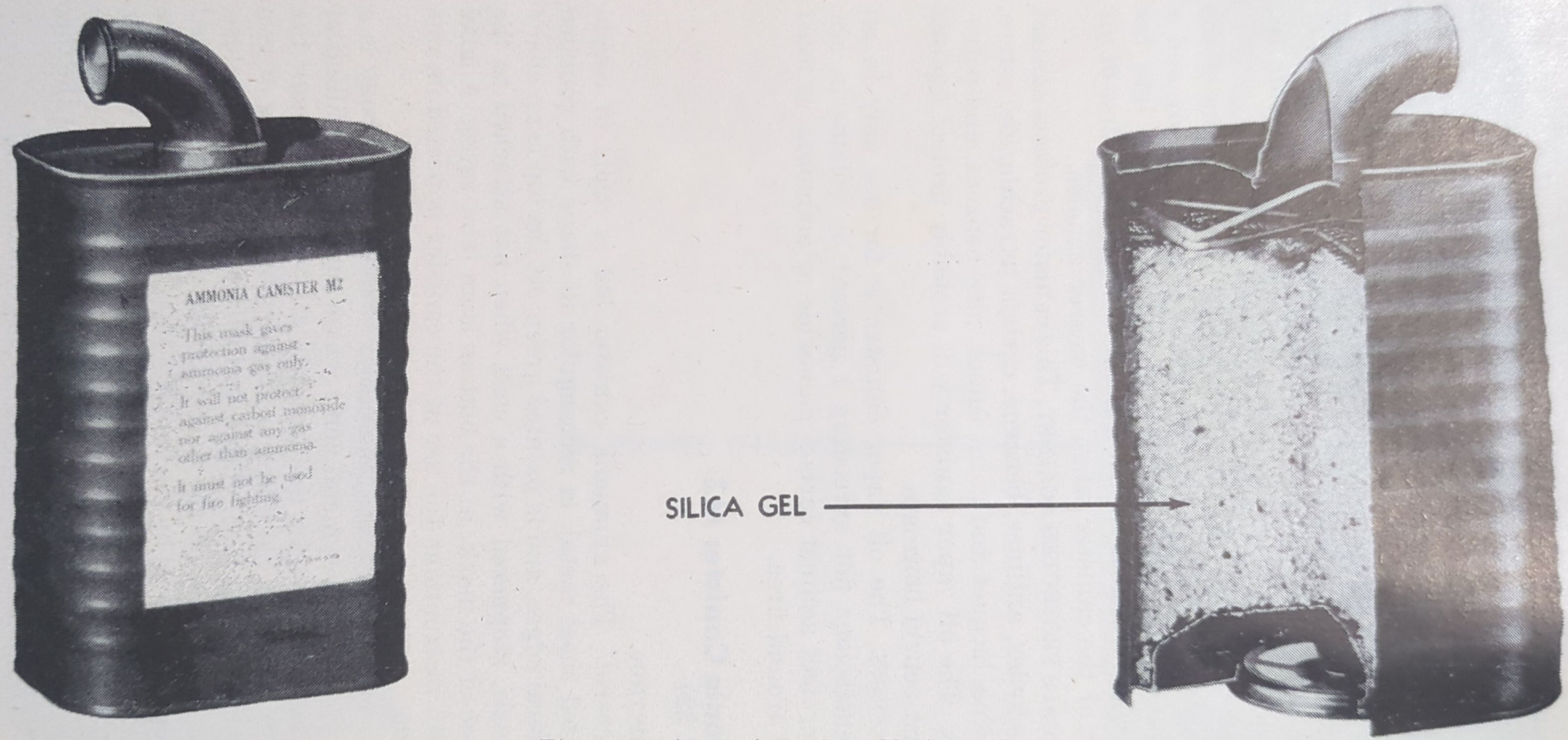


Figure 32. Ammonia canister M2 (green).

(3) *Inlet valve.* The inlet valve, located at the bottom of the canister, is composed of an inlet valve seat assembly and a rubber disk. This valve permits air to travel into the canister when the wearer inhales, but prevents flow of air out of the canister when the wearer exhales.

b. LIMITATIONS. Although the general practice of not using special purpose canisters in gas concentrations exceeding 1 percent by volume also applies to the ammonia canister, gas penetration does not become rapid until concentrations above 2 percent are reached; at lower concentrations, penetration proceeds slowly. Warning is given the wearer through gradual leakage of ammonia vapors; replacement of the canister then becomes necessary. Acute irritation of the skin is a signal that concentrations are too high. This canister does not give protection against carbon monoxide. It should not be employed against any gas except ammonia and must not be used for fire fighting.

44. HCN Canister M2
(fig. 33)

a. DESCRIPTION.

(1) *General.* The HCN canister M2 is made of corrugated sheet metal, is rectangular in shape with rounded lateral edges, and is painted yellow with a white top. At the top is an elbow nozzle, stoppered with a cork when not attached to the hose of the mask; at the bottom is an inlet valve. A label with instructions for use of the canister is pasted on one side.

(2) *Mechanical filter and chemical filling.* Air inside the canister body passes through a mechanical filter and then through a chemical filling. The mechanical filter consists of layers of filter material surrounding the container holding the chemical filling. The chemical filling, activated (type ASC impregnated) charcoal, is housed in a container, which has perforated sheet metal sides. A central inner tube, made of perforated metal and having flat sides, is covered with a thin felt bag, which restrains the charcoal dust. The solid ends of the container serve as closures and also keep the container in the center of the canister.

(3) *Inlet valve.* The inlet valve, located at the bottom of the canister, is composed of an inlet valve seat assembly and a rubber disk. This valve permits air to travel into the canister when the wearer inhales, but prevents flow of air out of the canister when the wearer exhales.

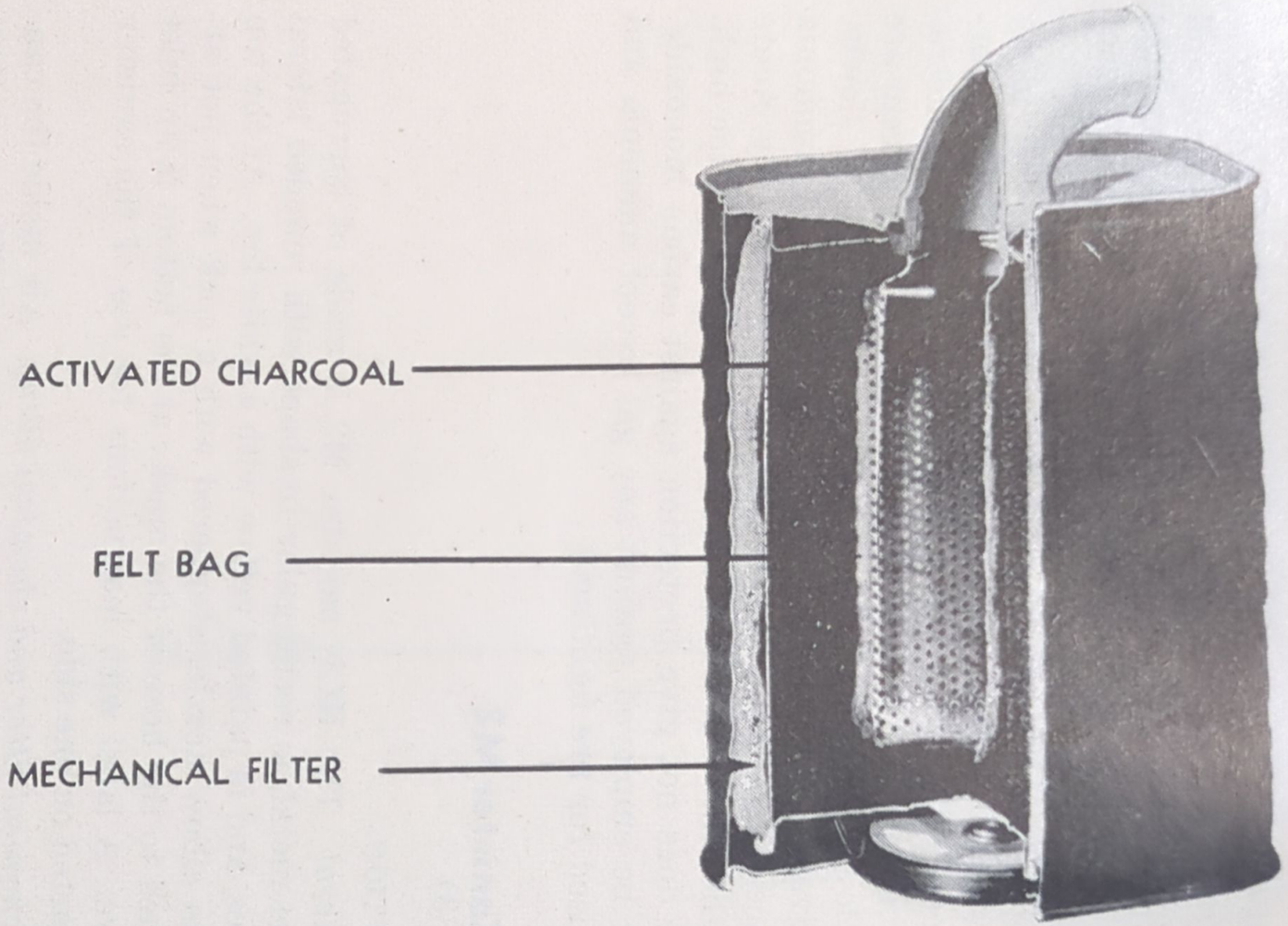


Figure 33. HCN canister M2 (yellow).

b. CHEMICALS PROTECTED AGAINST.

(1) The HCN canister protects against acid and organic vapors such as—

Acid vapors	*Organic vapors*
Acetic acid	Acetone
Chlorine	Alcohols
Cyanogen chloride	Anilines
Formic acid	Benzene
Hydrogen chloride	Carbon bisulfide
Hydrogen cyanide	Carbon tetrachloride
Hydrogen sulfide	Chloroform
Nitrogen peroxide	Chloropicrin
Phosgene	Ethers
Sulfur dioxide	Ethylene dichloride
	Formaldehyde
	Gasoline (and other petroleum derivatives)
	Toluene

(2) The HCN canister will probably protect against many other chemicals, including acetylene, cyclohexanone, kerosene, methyl bromide, paint, turpentine, and xylene.

c. EXTENT OF PROTECTION. This canister provides no protection against ammonia or carbon monoxide and must not be used in fire fighting. For fumigation work, the usual gas concentration is about 1/20 of 1 percent hydrogen cyanide and 1/30 of 1 percent cyanogen chloride. Against this concentration, the HCN canister gives adequate protection for a working man for 3 to 5 hours. In higher concentrations, this time is greatly reduced, and at the total concentration of 1 percent by volume, exposure should not be for longer than 1 minute per day. Skin absorption alone in a concentration of 2 percent hydrogen cyanide is sufficient to overcome a man in 10 minutes, although no skin sensation other than a superficial warmth may be noticed (par. 40*d*). When a wearer of the HCN mask is working in a fumigated space, traces of cyanogen chloride will give warning when the canister should be changed. During the first minutes of failure, minute quantities of cyanogen chloride penetrate the mask and cause noticeable, although harmless, irritation to the eyes.

Section III. CARRIERS

45. Gas Mask Carrier MIIIA1
(fig. 34)

a. GENERAL. Carrier MIIIA1 is an irregularly shaped, flat bag of olive-drab waterproofed duck used to hold the facepiece and canister. Outer side of carrier is extended to form a flap which

covers the opening at the forward edge. Two fastener assemblies secure the flap in place. The upper assembly consists of a socket and two studs so that carrier may be closed with the facepiece either in or out of the carrier. Upper and lower ends of opening, where front and back of body are joined, are reinforced with bifurcated (split) rivets. Edge of opening opposite the flap is reinforced by a 5-inch fold stitched in place.

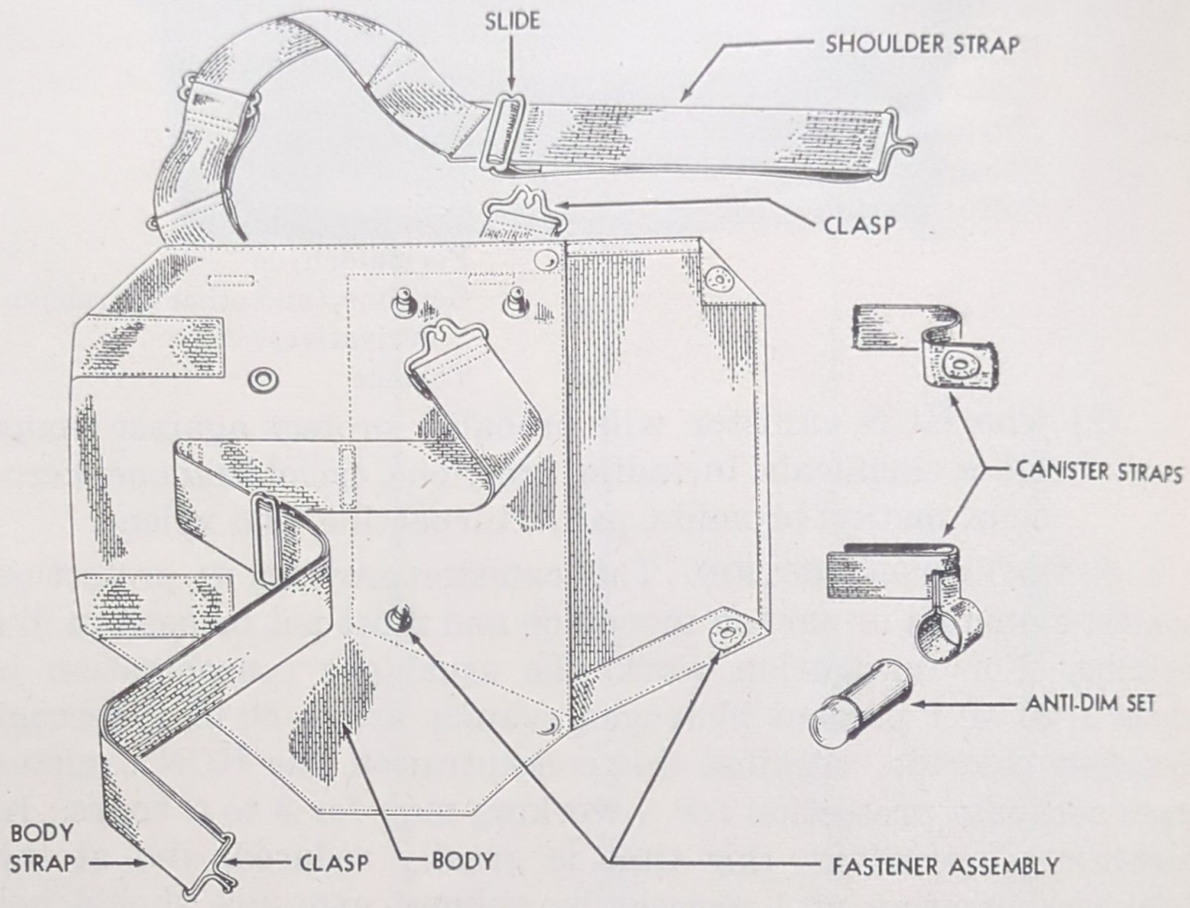


Figure 34. Gas mask carrier MIIIA1.

b. SHOULDER AND BODY STRAPS. Adjustable shoulder and body straps of 2-inch webbing support the carrier over the right shoulder and around the waist. The shoulder strap is sewed to the carrier body at one end, and at the other end has a double-pronged hook which engages the eye portion of the clasp on a chape sewed to the other end of the carrier body. The body strap is sewed to the carrier body and has a similar chape connection.

c. CANISTER STRAPS. Two web straps are located in rear of carrier to hold the canister in place. The upper strap may be fastened or released by means of a lift-the-dot fastener. A loop in the lower strap provides space for the antidim set MI.

46. Gas Mask Carrier MIVA1
(fig. 35)

a. GENERAL. Carrier MIVA1 is an irregularly shaped, flat bag of olive-drab waterproofed duck used to hold the facepiece and

canister. Outer side of carrier is extended to form a flap which is narrower at the bottom than at the top. This flap covers the opening at the forward edge of the carrier and is secured in place by two fastener assemblies. The upper assembly consists of a socket and two studs, so that carrier may be closed when facepiece is either in or out of the carrier. Stud of lower fastener assembly is attached to a short length of webbing sewed at the ends to the carrier. Lower part of opening where front and back of body are joined is reinforced by a button and washer. Edge of opening opposite the flap is reinforced by a 5-inch fold stitched in place. Rear part of carrier, where canister is held, is reinforced with an additional piece of material sewed inside and with cotton webbing stitched on the outside where edges of canister are apt to wear through.

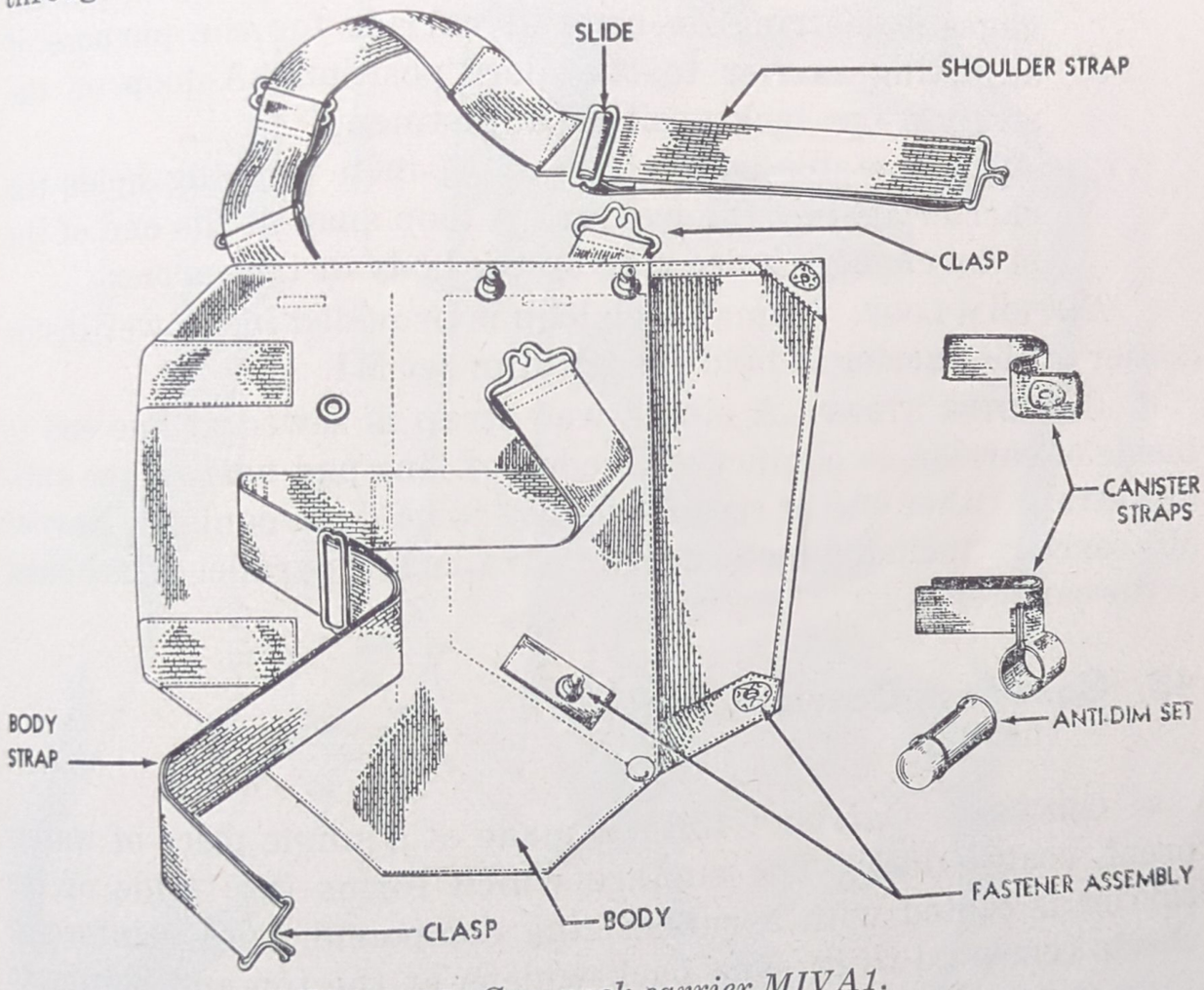


Figure 35. Gas mask carrier MIVA1.

b. SHOULDER AND BODY STRAPS. See paragraph 45*b*.

c. CANISTER STRAPS. See paragraph 45*c*.

47. Gas Mask Carrier M6
(fig. 36)

a. GENERAL. Carrier M6 is a rectangular bag of olive-drab water-proofed duck used to hold the facepiece, canister, and accessories. The back of the carrier is extended to form a flap which

covers the opening at the forward edge. Three lift-the-dot fasteners secure the flap in place when carrier is closed. Studs of the fastener assemblies are secured to the center of short lengths of webbing sewed at the ends to the carrier. This permits insertion of fingers under the fasteners when closing the flap. Three pockets of water-proofed duck, sewed inside the carrier on the side away from the wearer's body are for holding miscellaneous protective equipment. Two flannel lens pads to protect the lenses are stitched inside the carrier, one on the outer side of the middle pocket, the other directly opposite it on the back of the carrier.

b. SHOULDER AND BODY STRAPS.

(1) An adjustable shoulder strap of 1½-inch webbing allows the carrier to be suspended from the right shoulder. A loop snap on the shoulder strap at shoulder position engages a dee ring on body of carrier for the purpose of adjusting carrier to the alert position. A loop on the strap is for back position adjustment.

(2) An adjustable body strap of ¾-inch webbing holds the carrier against the wearer. A loop snap at the end of the strap engages a dee ring on the body of the carrier.

c. ANTIDIM LOOP. A small web loop is provided in a lower inside corner of the carrier to hold the antidim set MI.

d. CANISTER STRAP. A single web strap is sewed at one end to inside of carrier, in contact with edge of lens pad nearest the antidim strap. Other end of strap is looped to hold the canister. Earlier M6 carriers included two canister straps for parallel attachment to the canister.

48. Gas Mask Carrier C15R1
(fig. 37)

a. GENERAL. Carrier C15R1 is made of a single piece of waterproof, coated duck. The surface which forms the inside of the carrier is coated with a rubberizing compound, with reinforcing sheets cemented to it. The back widens at the top and bottom to form wings. Near the opening, the back is doubled to form a strip which is fitted with three clinch plates and sockets. In the front, near and parallel to the opening, is a fold control. Three stud fasteners are attached to the front, about 8¼ inches from the opening. Carrier is closed by rolling down the top on the fold control until the sockets on the strip across the back engage the stud fasteners on the front.

b. STRAP ASSEMBLIES. Two strap assemblies of 1½-inch webbing are provided for carrying the mask. The top strap assembly consists of two pieces of webbing which are sewed onto the wings

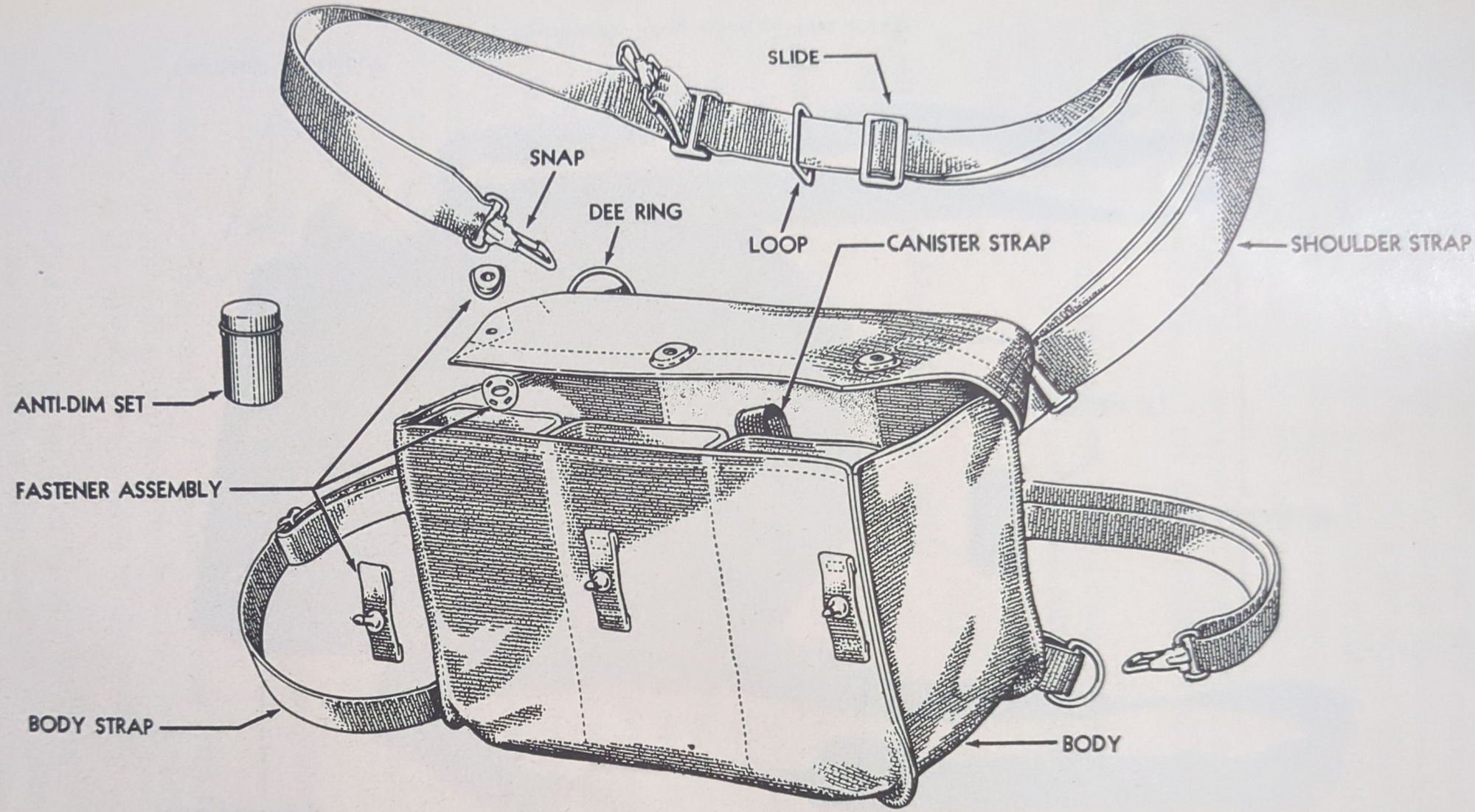


Figure 36. Gas mask carrier M6.

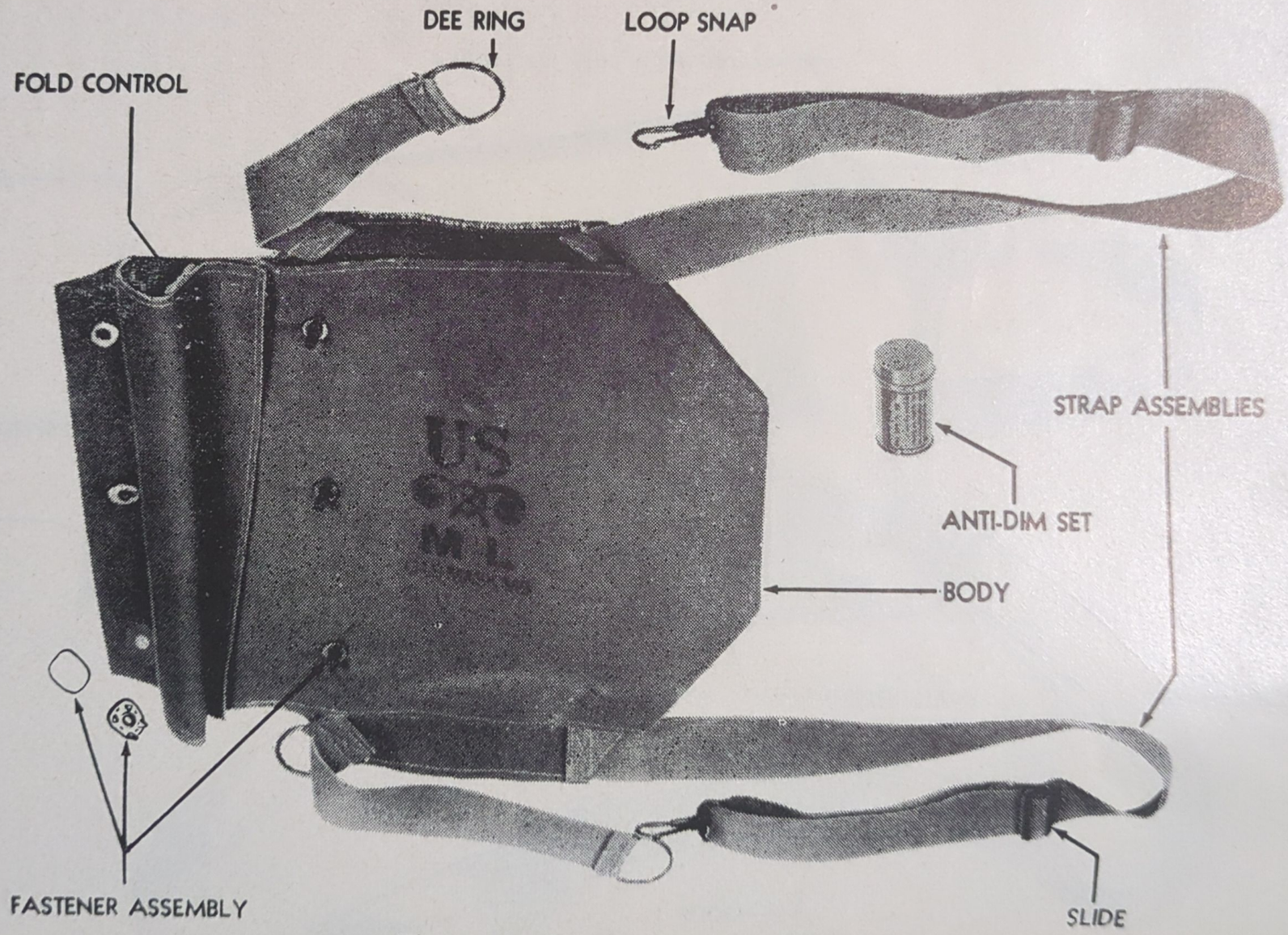


Figure 37. Gas mask carrier C15R1.

of the carrier. The longer of the two straps has a slide and a loop snap. The shorter strap is equipped with a dee ring onto which the loop snap is fastened. The bottom strap assembly consists of two pieces of webbing. The longer strap has a slide and a loop strap. The shorter strap is equipped with a dee ring; where this strap is sewed to the wing of the carrier, it is folded so that it forms a chape with a dee ring attached. This chape and dee ring are used when the carrier is in the leg carry position.

c. ANTIDIM LOOP. A loop of waterproof, coated duck is cemented in a lower corner of the carrier to hold the antidim set MI included with the mask.

d. POCKET. A pocket of waterproof, coated duck for miscellaneous protective equipment is sewed to the reinforcing sheet in the back of the carrier.

49. Snout-Type Gas Mask Carrier M10
(fig. 38)

a. GENERAL. Carrier M10 is a sacklike container made of waterproof cotton duck. A flap assembly, fitted with two clinch plates and sockets, is sewed on the back near the opening. A fold control is across the front of the carrier, just below the opening. On the front are two fastener strap assemblies sewed at the ends to the carrier; each is provided with a stud and washer. Carrier is closed by rolling down the top over the fold control until the sockets on the back flap engage the studs on the front fastener straps. The pocket blank is sewed inside the carrier to form two pockets which hold the accessories and the antidim set MI. To protect the lenses, two canton flannel lens pads are stitched inside the carrier, one on the outside of one of the pockets, the other directly opposite it on the back of the carrier.

b. STRAP ASSEMBLIES. Two strap assemblies are provided for carrying the snout-type mask.

(1) A strap assembly, made of 1½-inch webbing with a dee ring on one end and a loop snap on the other, is folded and stitched on the middle of the back of the carrier.

(2) Another strap assembly, made of ¾-inch webbing with a dee ring on one end and a loop snap on the other, is stitched in place on the back of the carrier near the bottom.

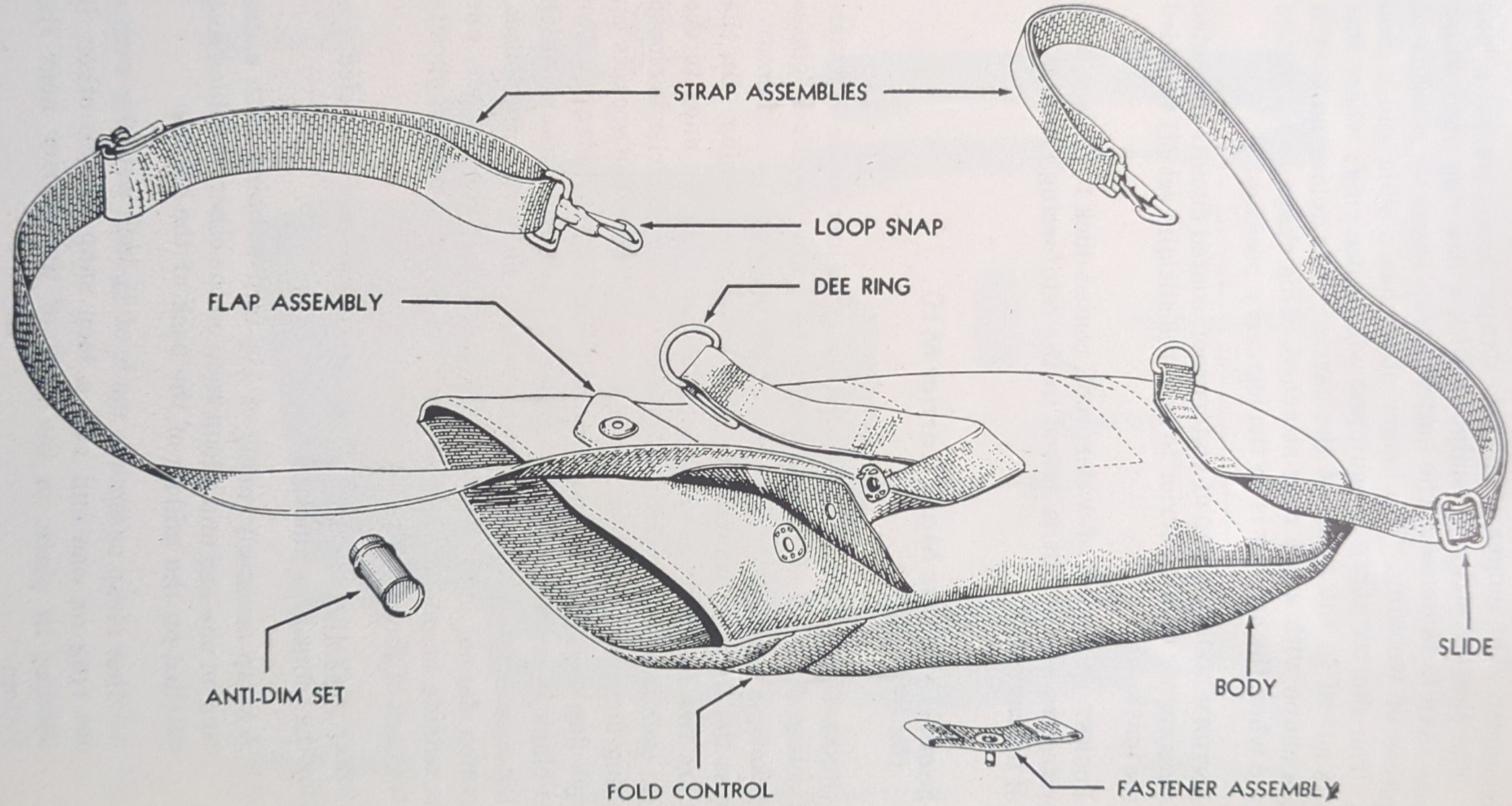


Figure 38. Snout-type gas mask carrier M10.

50. Headwound Gas Mask Carrier M9 (fig. 39)

Carrier M9 is formed from a single piece of vinyl resin sheeting with a heat-sealed seam at one side and the bottom. On the center of the back is a buckle strap, made of vinyl resin and heat-sealed to the carrier. It consists of a strap to engage the buckle on the front, and a loop to aid in carrying the mask. On the center of the front is a buckle holder of vinyl resin sheeting with a buckle attached. A fold control is heat-sealed in place on front of carrier near the opening. Fold lines and instructions for folding are stamped on front of carrier. Sides of carrier are folded on the dotted lines, and the top is rolled down tightly on the fold control to the buckle. Buckle strap on rear engages buckle on the front, closing the carrier.

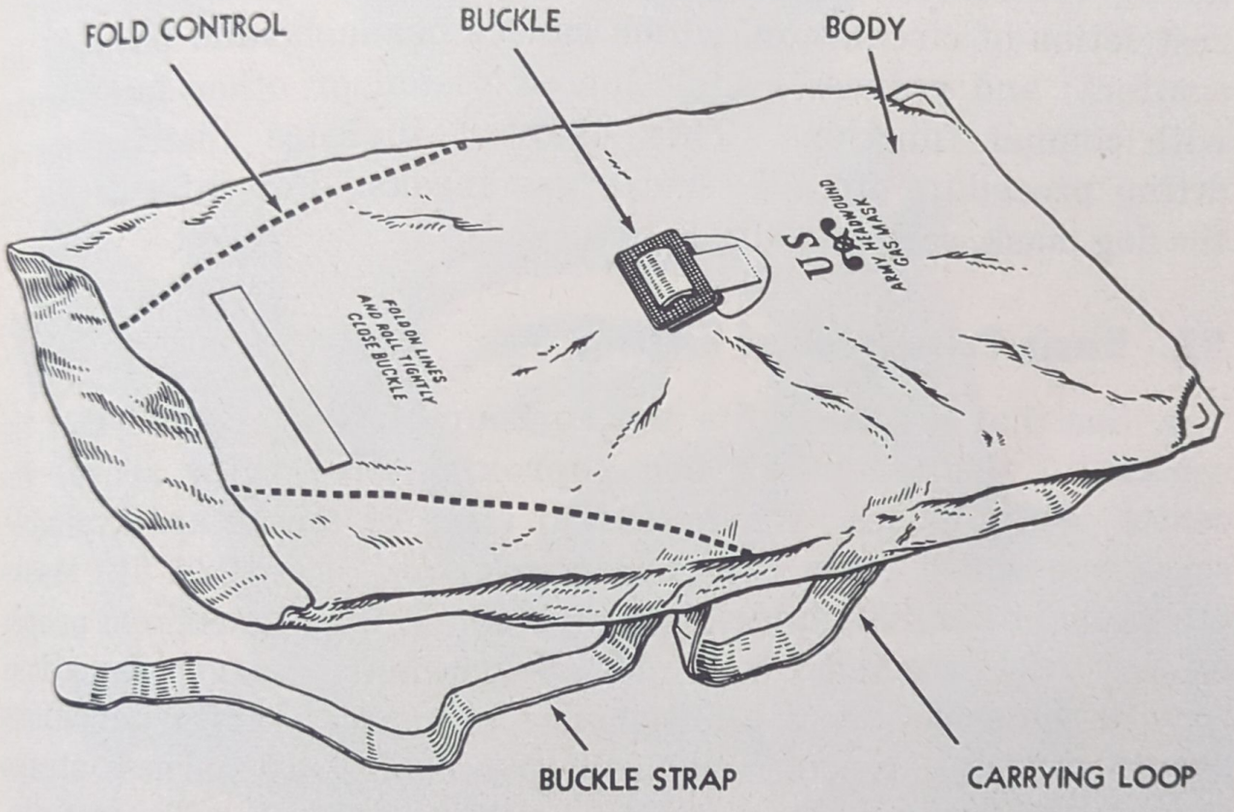


Figure 39. Headwound gas mask carrier M9.

CHAPTER 4

FITTING GAS MASKS

Section I. INTRODUCTION

51. General

Proper fitting of gas masks is a command responsibility which cannot be delegated to noncommissioned officers; a qualified officer will supervise the fitting. Masks will be adjusted and fitted as prescribed in FM 21–40. Selecting a mask to fit the facial characteristics of the individual at the time of issue helps to prevent decrease in combat efficiency caused by wearing the mask. Proper fitting eliminates unnecessary lung and eye casualties; prevents restriction of circulation, which causes headache and physical discomfort; and reduces restriction of vision or other interference with combat functions. This chapter includes instructions on fitting procedure for all service gas masks. For information on the dog mask, see appendix I.

52. Basic Principles of Fitting

a. See that the mask fits the contour of the face and that the centers of the eye pupils are approximately at (or above) the center of the lenses. When several sizes of masks are available, select one which gives the most comfortable gas-tight fit. Masks are made of flexible material so that small deviations from proper fit may be corrected by proper adjustment. Larger deviations require the selection of another size of mask. Larger deviations should not be corrected by adjustment of head harness straps because this may create a strain in the facepiece, will cause discomfort, and may cause leaks. Masks which are too small have a tendency to sit forward on the wearer's face, usually causing the upper cheek straps to cut the ears. If a mask is too small, the eyes will be too high for the lenses. If a mask is too large, the edges of the facepiece will interfere with the ears and throat of the wearer, and the eyes will be too low for the lenses.

b. When facial deformities prevent normal fitting, gaps must be closed in around edges of mask. Gaps at temple positions can be filled in by the insertion of a roll of elastic webbing 5/8 inch in diameter under the tab assembly on either side of the mask. To close gaps at other locations, it may be necessary to stitch elastic webbing to the tab assemblies or to the rubber of the faceblank.

Stitching through the rubber of the faceblank should be sealed with rubber cement. Figure 40 shows how a gap at the cheek position of the M9 mask may be filled in by stitching a length of elastic webbing to the tab assembly at the temple position on each side and under the chin to permit a roll of webbing to be sewn under the elastic in a suitable position to stop the leakage.

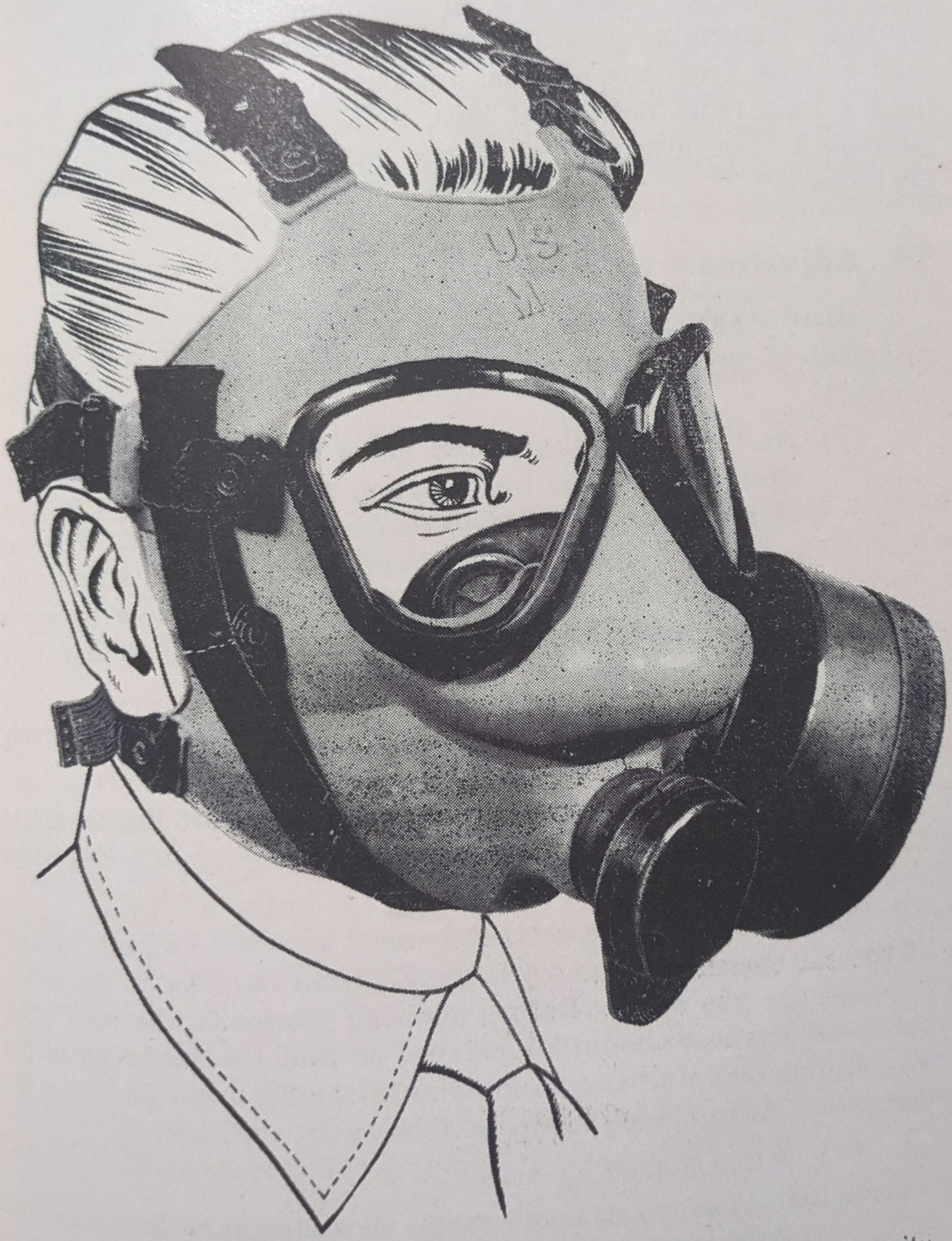


Figure 40. Use of elastic webbing to alter shape of mask to fit facial deformity.

Section II. DETAILED FITTING PROCEDURE

53. Preliminary Procedure

Have individual sling mask and remove facepiece from carrier. Head harness should be loosened by folding the buckles back 180° against the webbing and grasping the ends of the slide with the thumb and finger of the right hand. With the left hand, pull the elastic straps until each clinch tip is about 1 inch from the buckle. Have individual place mask on his face with his chin resting snugly in chin pocket. Grasp eyerings and spring mask slightly from his face; mask should settle back in a symmetrical and comfortable position. Determine position of eye pupil in lens. If pupil is less than ½ inch from top of lens, mask is too small; if pupil is less than 1 inch from bottom of lens, mask is too large. If correct position is not attained, exchange mask for one that may be positioned.

54. Adjustment to Individual

a. HEAD HARNESS. Even tension of the head harness straps is essential to prevent leakage, temple pressure, and general discomfort.

(1) As the man being fitted holds mask firmly against his chin, center head harness pad fairly well down on back of his head and hold it there with one hand. With the other hand, tighten each of the forehead straps just enough to remove any slack. (The one-piece buckle is best adjusted by a rapid pull or jerk, rather than by a steady pull on the harness strap.)

(2) Tighten each of the cheek straps until they are evenly and moderately tightened.

(3) Remove hand from head pad and adjust temple straps to moderate tightness. These straps should clear tops of ears.

b. NECK STRAP. A neck strap is used with the C8 head harness of the M9 gas mask and with the C4 head harness of the snout-type service gas mask. Before donning the mask, the neck strap and head harness should be grasped so that the mask can be put on without trapping the neck strap in the head harness or in the facepiece. Adjust neck strap as follows:

(1) *With C8 head harness.*

(*a*) After mask is on, grasp neck strap and lead it around the back of the neck, smoothing it to avoid twisting.

(*b*) Fasten the fastener tab assembly at end of strap to the stud on the tab assembly at cheek position of facepiece.

(*c*) Draw up the elastic web strap by means of the adjustment slide so that it fits snugly, giving stability to the mask. This is necessary because of the pendulum action of the canister when the wearer is running or violently exerting himself.

(2) *With C4 head harness.*

(*a*) After mask is on, grasp neck strap and pass it through the loop suspended from the triangular head pad.

(*b*) Fasten the fastener tab assembly at end of strap to the stud on the tab assembly at cheek position of facepiece.

(*c*) Draw up the elastic web strap by means of the adjustment slide so that it fits snugly, giving stability to the mask. This is necessary because of the pendulum action of the canister when the wearer is running or violently exerting himself.

c. NOSE-CUP. Nose-cups are used in the lightweight service masks, the M9 mask, and the snout-type service mask. The nose-cup may cause excessive pressure on the bridge of the nose. Under the supervision of a qualified officer, slit the nose-cup as follows to relieve this pressure:

(1) With facepiece held open and with curled upper edge of nose-cup pulled out and flattened, make a mark on center of nose-cup ½ inch from the upper edge.

(2) Place a 2-inch by ½-inch piece of nonsurgical adhesive tape at the mark toward the mask side to prevent cutting too deeply (fig. 41).

(3) Slit nose-cup along center line up to the tape marker (fig. 42).

(4) By fitting the mask to the wearer's face, check to determine whether the ½-inch cut is sufficient to relieve pressure. If pressure persists, remove mask, change position of tape to extend the slit ⅛ inch, and again fit mask to wearer's face. Further adjustment in this manner may be needed, but be careful that the slit does not extend beyond bridge of nose, leaving an unsealed opening, since exhaled air blowing from the nose-cup may cause some discomfort to the eyes and fogging of the eyepieces.

(5) When nose-cup is fitted correctly, remove the adhesive tape, as it may peel off under moist conditions.

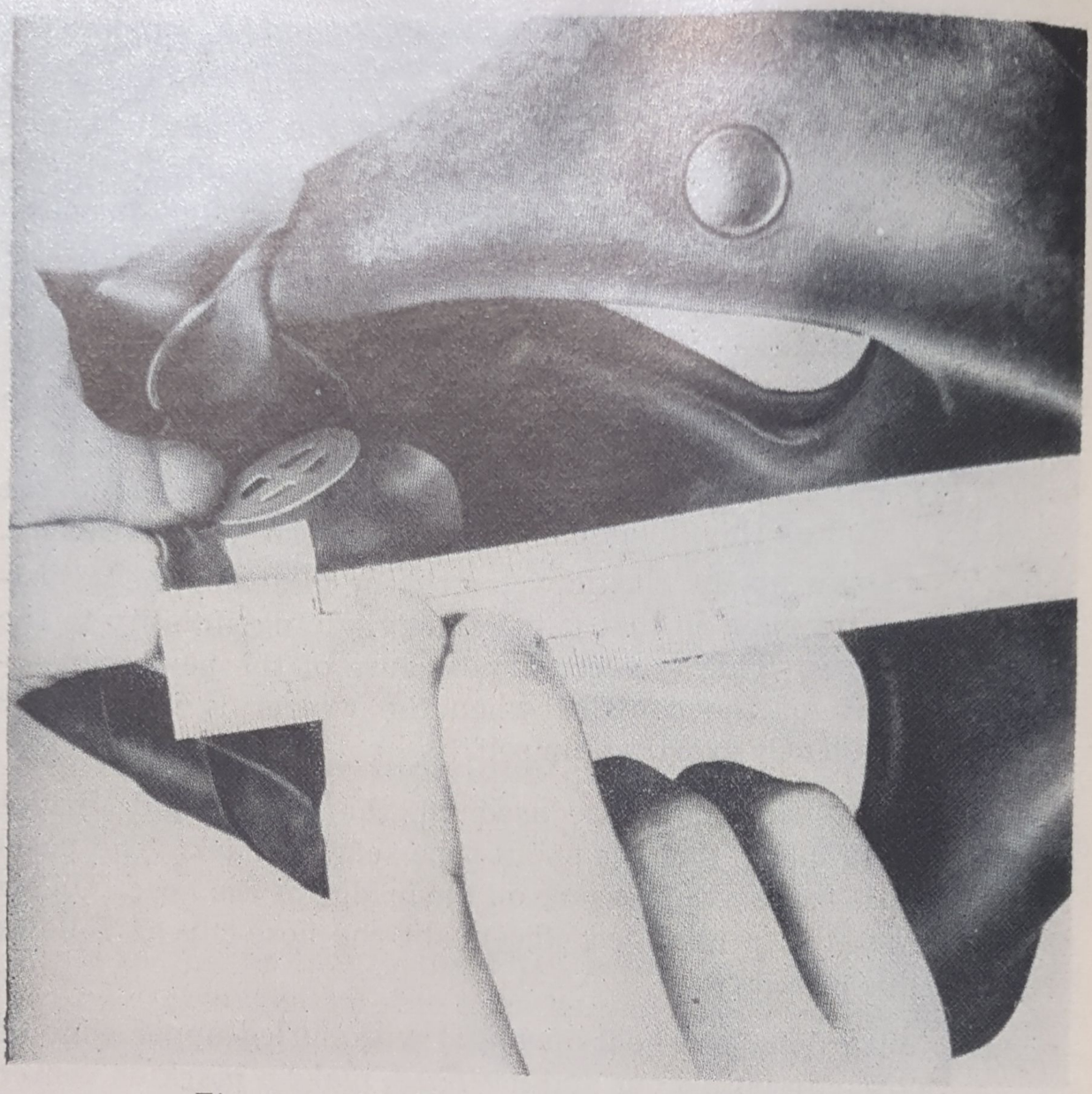


Figure 41. Marking nose-cup with adhesive tape.

(6) Place a small patch from the gas mask repair kit on outer surface of nose-cup to reinforce it and to prevent further slitting.

(7) Fitting of nose-cup may sometimes cause it to interfere with the vision of the wearer. Correct such interference by trimming edges of nose-cup with shears.

55. Leakage

a. GENERAL. The air which a person inhales may escape passage through the canister by leakage at the periphery, or through holes in any component of the mask. Each mask should be tested for leakage and defects corrected.

(1) *Tests.* With palm of hand over inlet valve of canister (or with walls of hose pinched together), have wearer inhale normally and hold his breath. When facepiece tends to collapse, it is an indication of an effective air seal; that is,

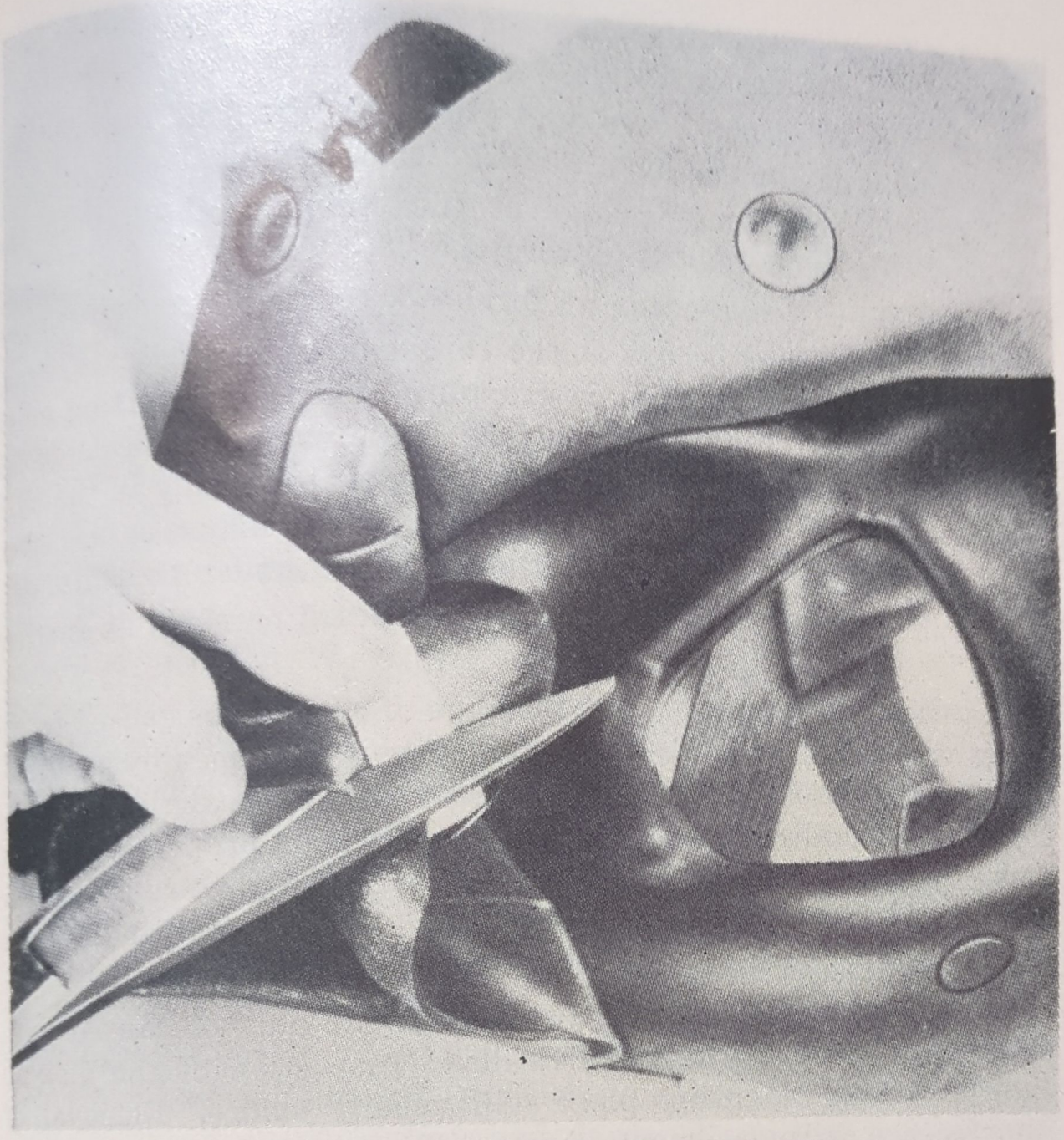


Figure 42. Slitting nose-cup along center line.

no leakage. (If the wearer inhales too strongly, he may close a hole that would leak on normal breathing.) If facepiece does not collapse, it is an indication of a faulty mask or incorrect adjustment to the face.

(2) *Correction.* The detection of the leak is imperative. If it is not possible by the steps detailed in *b* through *e* below to locate the leaking component, the mask must be replaced and sent to a maintenance unit for repair.

b. LEAKAGE AROUND PERIPHERY. Air flow from around the edges into the facepiece is corrected by the procedure outlined in (1) through (5) below. Visual inspection will usually disclose a bulge at the periphery at the point of leakage. The individual may be able to point out the source by feel of incoming air. Periphery leakage can be detected in some cases by observing breaks in the red mark left on the face by facepiece edges after prolonged wear-

ing. Leakage around facepiece edges is caused by improper head harness adjustment or fitting of improper mask size.

(1) To overcome leakage at the cheek, lift head harness pad higher on the head and tighten forehead straps.

(2) To overcome leakage at the temple, tighten both the forehead and temple straps.

(3) When leaks occur at forehead, tighten forehead straps.

(4) If leakage occurs at the throat or under the chin, readjust mask on face by grasping eyerings and lifting mask slightly higher on the face. This overcomes leakage resulting from the chin not being seated firmly in the chin pocket. Tightening the cheek straps may also assist in correcting leakage at the throat or under the chin.

(5) If leakage around the periphery still persists, fit another size mask.

c. OUTLET VALVE LEAKAGE. Leakage of air may be caused by an outlet valve disk which is either faulty or is held open by an interference or because it sticks to the seat. Rapidly exhaling several times will usually clear any debris and permit proper seating of disk. Sticking disks may be released by pressing on rubber cover or by probing gently with a match stick. Defective valve disks (or entire valves) must be replaced.

d. INLET VALVE LEAKAGE. Leakage of air may be caused by a sticking or defective inlet valve disk. Inspection of the disk in canister or in mounting piece will usually suffice. Removal of interference or replacement of disk will remove source of leakage.

e. HOLES IN COMPONENTS. When other possible sources of leakage have been exhausted, all portions of the mask should be examined closely for breaks, tears, holes, splits, or other means of air entrance. Such defects may occur in faceblank, around eyepiece, in hose, or in canister. Holes in facepiece should be patched; other components should be replaced.

56. Checking Fit

Check fit of the gas mask as follows:

a. Examine eye position to see that lenses fit over eyes so that eye pupils are near the center of the lenses (par. 53).

b. Check mask to see that it does not fit so tightly that pressure is exerted on the flesh around the eyes, causing them to be partially closed.

c. Check to see that mask does not press painfully on the nose or cut into the flesh at the throat of the wearer.

d. Check periphery of mask for overlap at the ears or for overlap at the chin to the extent that it cuts into the throat. A short periphery is equally unsuitable. Proper fit is attained in a mask which comes well up on the forehead and where the periphery is within 1 inch of the ears.

e. If slight gaps or channels are present, carefully adjust head harness (par. 54).

f. If an adequate fit cannot be attained, try either a larger or smaller size mask.

57. Gas Chamber Test

a. GENERAL. If there is sufficient time, the gas chamber test prescribed in the training outline in FM 21–40 should be used. If time is limited, a modified procedure may be employed. When using the modified procedure, have each man fitted with a gas mask enter a gas chamber containing CN. Sufficient concentration can be maintained in a 1,000-cubic-foot-capacity gas chamber by vaporizing one CN capsule every 10 minutes. This gas concentration is based on the use of a well sealed chamber.

b. EXERCISES. To insure gas mask against leakage under strenuous field conditions, have each man perform certain exercises in the gas chamber. This should be done under the supervision of an officer or a noncommissioned officer. Have each man test his mask by inhaling and exhaling quickly and fully five times. Instruct him to bend forward and back quickly five times and then shake his head vigorously up and down. Have him hop on each foot five times. Leaks discovered during these exercises in the gas chamber may be corrected by additional adjustment of the head harness straps.

c. CHECKING FIT. After the man has passed through the gas chamber and has performed the exercises, examine mask to determine whether proper fit has been maintained. Evidence of improper fit indicates that further adjustment or the issuance of a new mask is required. In either case, see that the individual reenters the gas chamber for a further test in order to insure correct fit.

58. Adjustment of Headwound Gas Mask

a. GENERAL. Adjustment of the headwound gas mask must be made by trained personnel. Avoid folds and channels around the neck which interfere with a gas-proof seal. To eliminate bellowing of mask and rebreathing of exhaled air, avoid dead space wherever possible.

b. WOUNDS ABOVE CHIN LEVEL.

(1) As the patient holds his breath upon hearing the gas alarm or command GAS, grasp hood on either side and pull it over patient's head without disturbing the bandages (fig. 43).

(2) Center the top loop on the head and eliminate channels and folds as skirt of hood is smoothed out.

(3) Pull ends of neck strap to rear of head (fig. 44). Pull down skirt of hood, eliminating dead space, and smooth out folds and channels to insure a gastight seal. Tie neck strap as tightly as injury permits (fig. 45). (Straps should be tied with bow knots so that mask may be removed readily when no longer needed.)

Figure 43. Pulling hood of head-wound gas mask over patient's head.

Figure 44. Pulling ends of neck strap to rear.

(4) Adjust middle straps by crossing them at rear of head (fig. 46).

(5) Bring these straps forward and cross them under chin (fig. 47).

(6) Carry straps up sides of head and pull them through top loop (fig. 48).

(7) Return straps to rear of head, passing one of the straps under the first crossing as an anchor (fig. 49), and tie straps together (fig. 50).

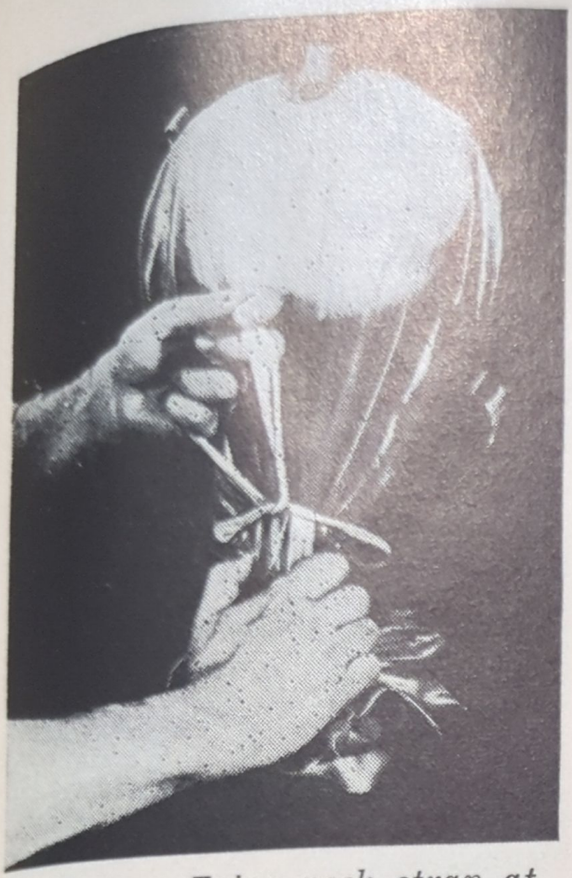


Figure 45. Tying neck strap at back.

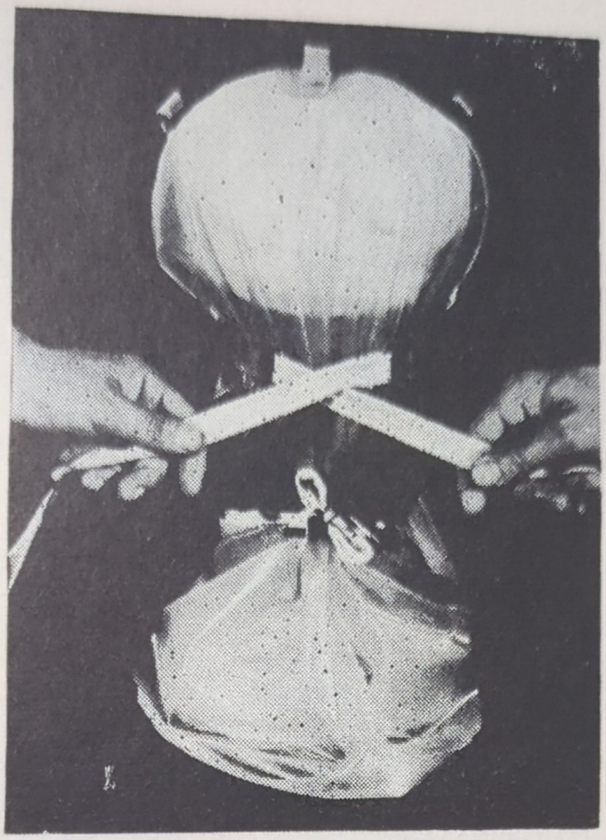


Figure 46. Crossing middle straps at back of head.

Figure 47. Bringing straps forward and crossing them under chin.

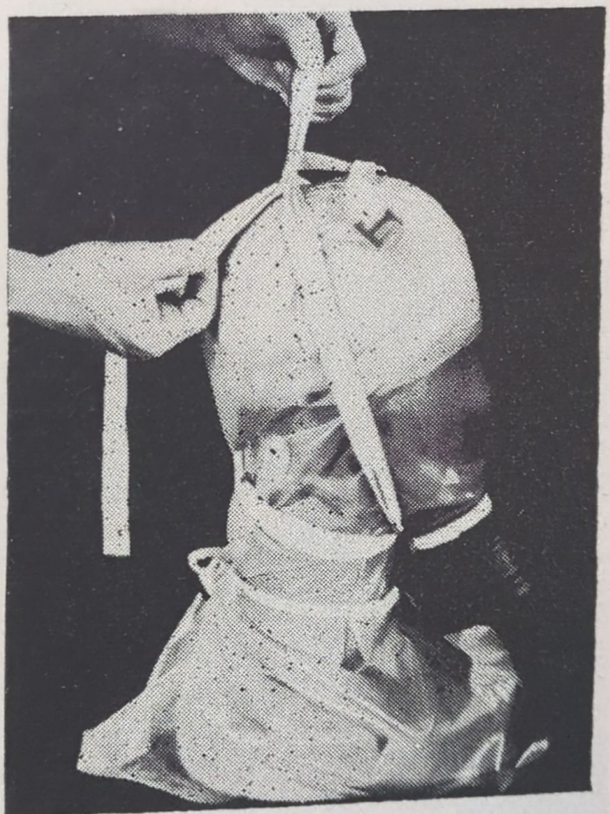


Figure 48. Bringing straps up sides and pulling them through loop at top of head.

(8) Tie top straps at back of head (fig. 51) to eliminate dead space and adjust mask completely (fig. 52).

c. WOUNDS BELOW CHIN LEVEL.

(1) For wounds below level of chin, follow procedure given in *b* above, except in (3); in this case, position the neck strap in such a way that it will not cause pressure on the wound. During adjustment of mask, instruct patient to

Figure 49. Returning straps to back of head, with one strap passing under first crossing.

Figure 50. Tying straps.

Figure 51. Tying top straps at back of head.

Figure 52. Headwound gas mask adjusted.

hold his breath as long as possible and then to breathe quietly until adjustment is complete.

(2) To effect the gastight seal required, dry perspiration from the skin of the patient and apply adhesive tape. From midway of the back, between waist and shoulders,

apply 3-inch tape over the shoulders close to the neck and down to the skin of the breastbone. Excessive tension in the tape must be avoided if elastic tape is unobtainable, because normal movement of the chest causes tape to become displaced if it is too tight. The two chest-to-back shoulder tapes eliminate dead space (fig. 53).

(3) Apply tape to edge of hood so that it is sealed to the skin (fig. 54).

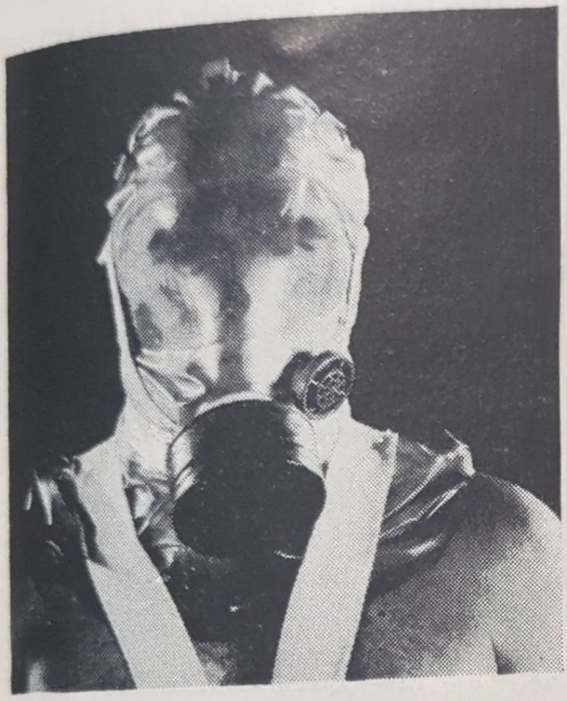


Figure 53. Chest-to-back shoulder tapes.

Figure 54. Sealing edge of hood to skin with tape.

(4) Extreme difficulty in obtaining a gastight seal makes it necessary that the foregoing instructions be carried out carefully. Be sure that all perspiration is dried from the skin, that the tape is applied as prescribed, and that the activity of the patient is kept to a minimum.

CHAPTER 5
GAS MASK ACCESSORIES

59. General

Accessories, which are stowed in the carrier, are provided to supplement the gas mask in order to give further protection to the individual under varying circumstances. Accessories are issued only when their use is anticipated. This chapter includes information on the gas mask waterproofing kit M1 and outlet valve cover M1. For information on other accessories, see TM 3–290.

60. Gas Mask Waterproofing Kit M1

The gas mask waterproofing kit M1 (fig. 55) is designed for waterproofing rectangular canisters and, when required, is issued to each individual who is equipped witih a gas mask having a rectangular canister. The M1 kit consists of two metal hose clamps, twelve 4-inch squares of waterproofing adhesive tape, one 3-yard roll of ½-inch adhesive tape, and an instruction card. These items are contained in an olive-drab cotton duck case placed in the gas mask carrier.

Figure 55. Gas mask waterproofing kit M1.

61. Waterproofing Procedure

To waterproof the canister, proceed as follows:

a. Apply tape firmly over side seam of canister (fig. 56); then apply it snugly over top and bottom rolled edges (fig. 57).

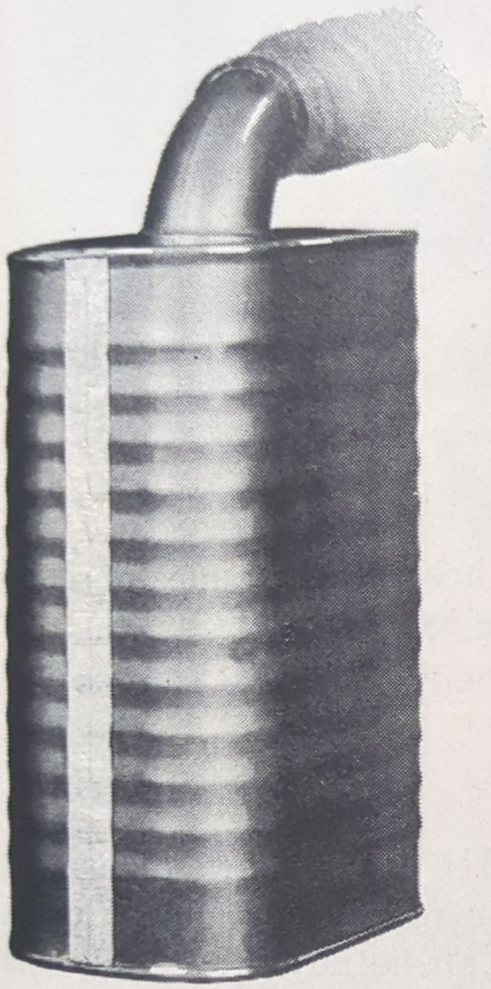


Figure 56. Tape over side seam.

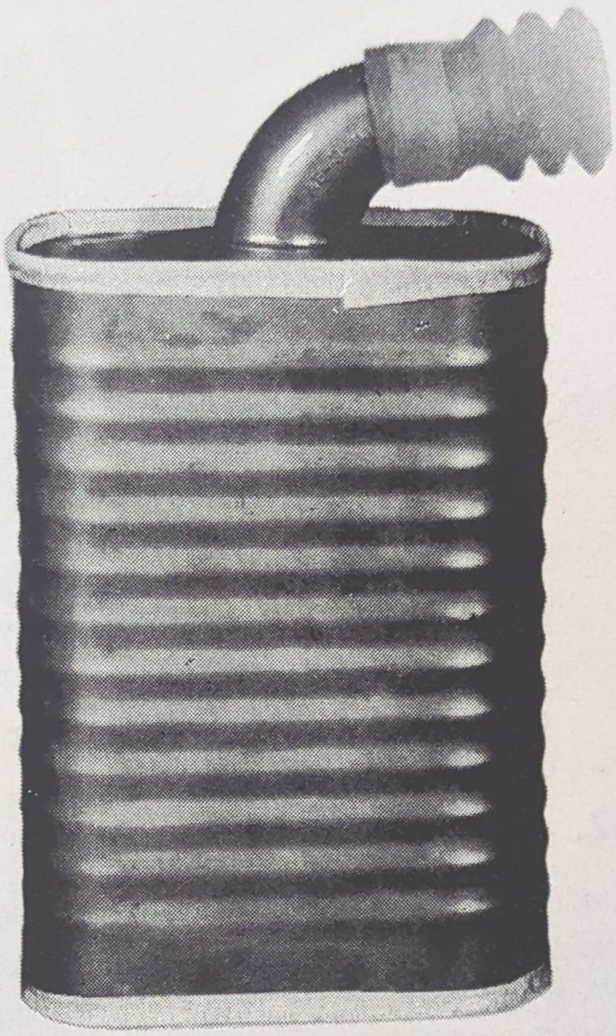


Figure 57. Tape over rolled edges.

b. Center an adhesive square over inlet valve, being sure that it adheres to the rim and edge and that it is firmly sealed at all points (fig. 58).

c. Place a wire clamp on hose at third or fourth corrugation from facepiece as follows:

(1) With clamp open, hold rectangular body of clamp with tongue side up, and with tongue between thumb and forefinger so that tongue extends horizontally beyond the hand (fig. 59).

(2) Lay hose across tongue of clamp, with tongue at third or fourth corrugation of hose.

(3) Bend hose around the tongue.

Figure 58. Adhesive square over inlet valve.

(4) Swing body of clamp toward hose so that sides of clamp fit the grooves adjacent to the tongue.

(5) Latch tongue into keeper on body of clamp (fig. 60).

62. Outlet Valve Cover M1

a. The outlet valve cover M1 (fig. 61) is designed to prevent freezing of the gas mask outlet valve for at least an hour at minus 22° F. in a 10-mile wind. This cover can be adjusted easily and rapidly and offers little resistance to exhaled air. It fits any standard outlet valve.

b. The outlet valve cover M1 is made of olive-drab knitted wool cloth, adapted to be slipped over the outlet valve through a slit located at the back of the cover. Cover is tied to the outlet valve guard by means of a cord. All edges are stitched to prevent raveling.

Figure 59. Applying clamp.

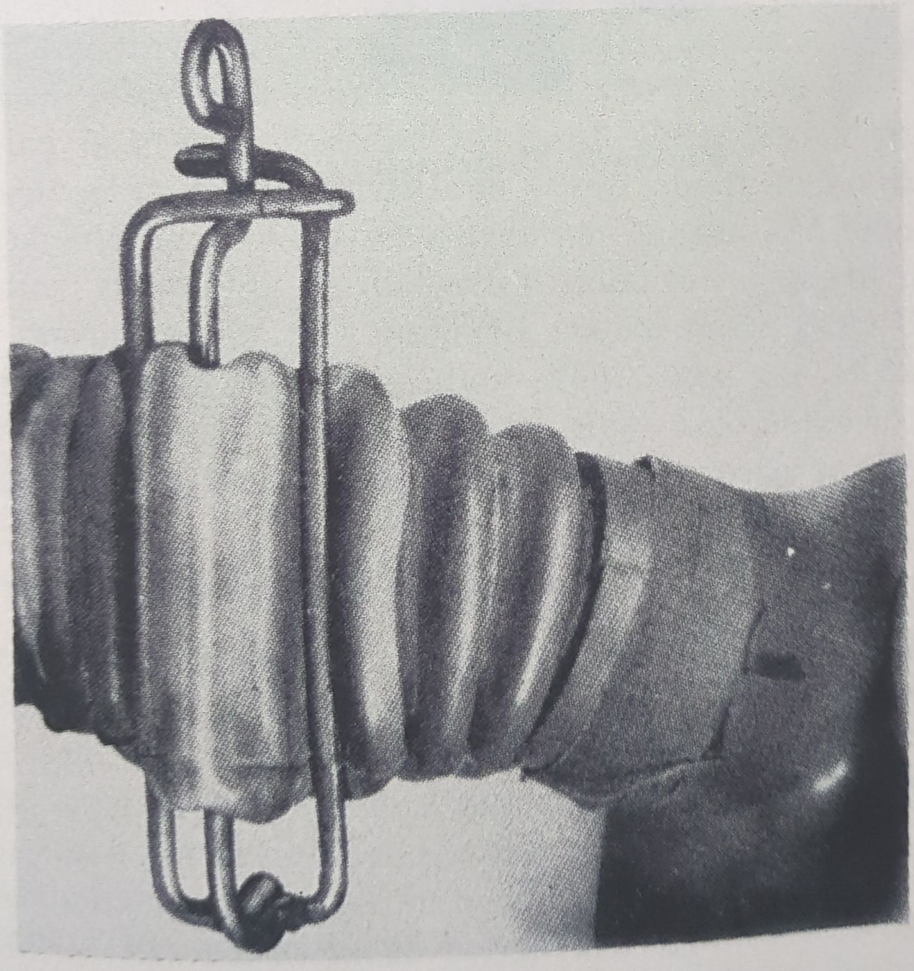


Figure 60. Clamp latched on hose.

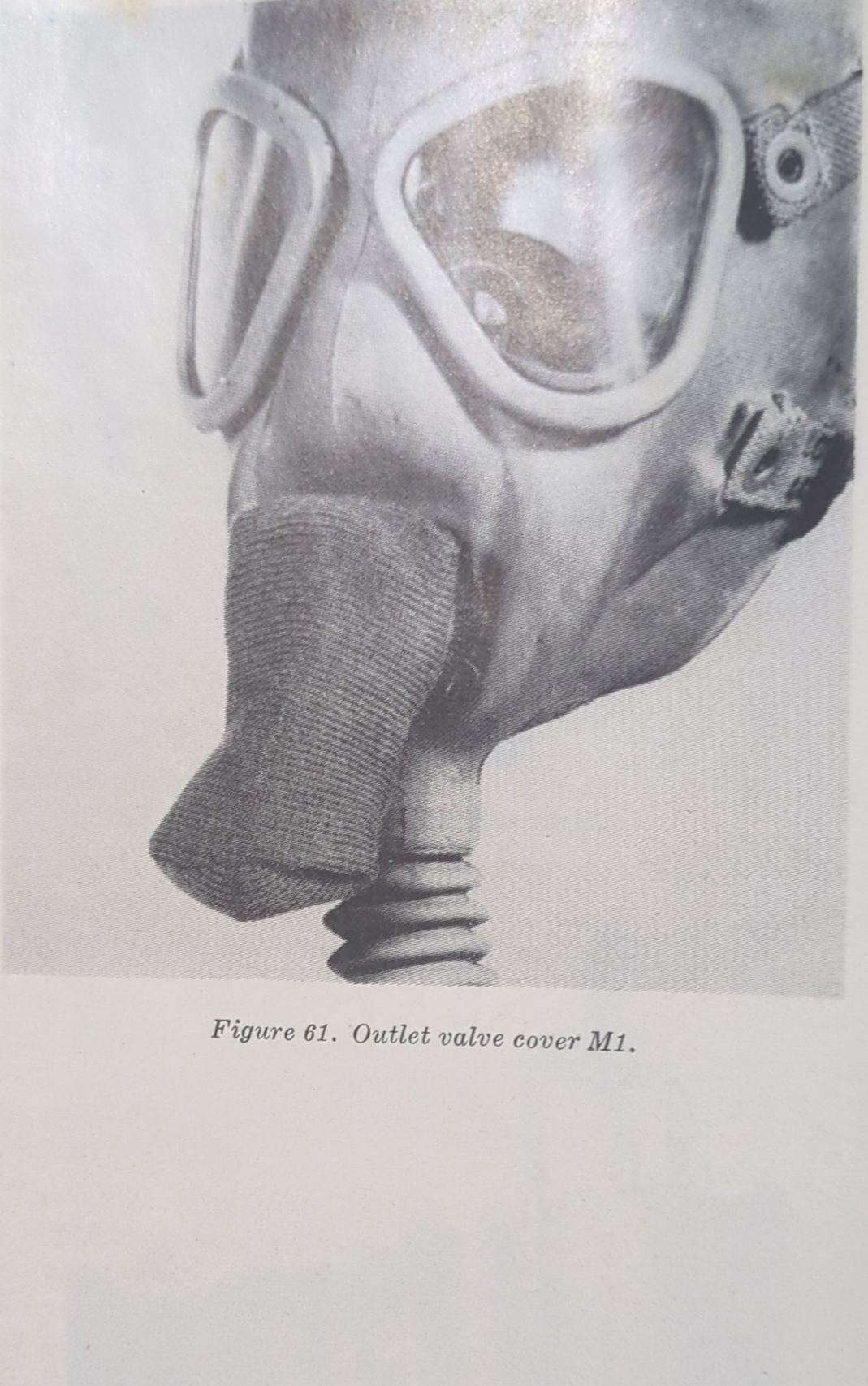


Figure 61. Outlet valve cover M1.

CHAPTER 6

CARE AND INSPECTION OF MASKS

Section I. CARE OF MASKS

63. General

With reasonable care and attention, the gas mask will have long life because it is designed to withstand the wear and tear of field service; however, there is always danger of mechanical damage to rubber or metal parts or to eye lenses, from rough handling. There is also danger of exposure to heat, of water getting into the canister, of dampness causing deterioration of protective tape and wire bindings, and of mildew attacking the fabric of the carrier. Masks should be kept in a cool, dry place.

64. Care of Rubber Parts

Aging of rubber is a form of oxidation which starts slowly and proceeds at an increasing rate, especially when the rubber has free contact with oxygen in the air, and in the presence of sunlight. First, the rubber begins to set; then it becomes tacky; finally, it turns dry and brittle. When it reaches the tacky stage, apply talcum powder. As this stage advances, the mask becomes worthless. Aging is greatly speeded by light, heat, and contact with organic solvents. These conditions bring about rapid deterioration and should be avoided wherever gas masks are kept. Unnatural folding, stretching, or distortion leads to failure of the mask. For this reason, never pile unboxed masks more than five high, and do not pile other weights upon them. The use of fiber faceforms, crushed newspaper, or storage racks also helps to preserve masks. In the field, be sure mask is placed correctly in the carrier.

65. Care of Mask in Cold Climate

All facepieces and hose, particularly those which are black (synthetic rubber), are subject to cold set (stiffening), which makes proper fit and seal difficult to obtain. Those marked G or GRM inside the nose protrusion are especially susceptible. Masks of these types are not recommended for use in a cold climate; however, if such masks are issued in a cold climate, they must be given special care. This stiffening is not of the type caused by folding or cramping of the rubber, but is induced solely by low tempera-

tures. A man in a cold climate should examine his mask once a day and take measures to keep it pliable. Where possible, stored masks should be kept in a heated room prior to issue. After issue, as a matter of daily routine, each man should carefully knead the rubber of his mask with his fingers, in wearing position or otherwise, until flexibility is restored. Carrying the mask under outer clothing is of great assistance. In rear areas, flexibility may be restored by exposing the rubber parts of the mask to room temperature of 70° F. for as long as necessary, to temperatures of 100° to 115° F. for 1 to 2 hours, or by immersing facepiece in water at about 100° F. for 2 minutes. The hose may also be partly immersed, but water must not be allowed to enter the canister. Dry mask thoroughly.

66. Cleaning and Conditioning

Individuals clean their own masks except in the case of mass salvage operations. All components of the gas mask, except the canister, may be cleaned by removing superficial mud, grease, and soil, and by washing with G. I. soap and cool or lukewarm water. *Do not wash canisters in water;* clean by scraping or brushing off all mud, grease, or soil, and repaint, if necessary. When washing other components of the mask, *take care to keep water out of the canister or the interior of the hose where it can drain into the canister.* To keep water out of hose and canister, place the canister at a higher level than the facepiece during cleaning operations. A rack with a high shelf for the canisters and lower notches to hold the facepieces is convenient if a number of masks are to be cleaned at one time. The final rinse water must remove all traces of soap from rubber parts. Dry masks at room temperature. After rinsing mask, wring out carrier, air-dry it, and smooth it out. When outside of continental United States, rub recoloring compound (type I, color C green—QMC Specification 4–1131) evenly into the carrier with a stiff brush, hang up the carrier, and then dry-brush it. Use of recoloring compound makes the carrier water-repellant, mildew-resistant, and fire-resistant. Recoloring compound should not be applied to rubber-coated material and is not used in the rehabilitation program for masks returned from overseas or turned in by posts, camps, and stations.

Caution: The recoloring compound is flammable. Also it should not be left in prolonged contact with the skin. Use lead-free gasoline to remove it from the skin and then wash skin with soap and water.

Masks should be cleaned and conditioned twice a year and when they are turned in for reissue.

67. Disposal of Infectious Masks

There is no standard gas mask disinfectant. Masks which cannot be put into usable condition by washing must be destroyed. Gas masks determined to be infected with mycobacterium tuberculosis or pathogenic spore-forming organisms should be destroyed by burning. Under no circumstances should an attempt be made to salvage such masks by sterilizing them by boiling or autoclaving.

68. Decontamination

Gas masks, complete permeable protective (impregnated) clothing, and shoes treated with protective dubbing (shoe impregnite) should be worn by persons in contact with contaminated gas masks or components. Impermeable gloves are necessary if there is a possibility of contact with liquid contamination. Contamination which has resulted from exposure of the mask to blister gas vapor or liquid may be combatted by the individual soldier alone, or with the help of his unit in the ways described in *a* through *e* below. Large-scale decontamination of gas masks and accessories will be performed by decontamination units. Refer to TM 3–220 for full information on decontamination.

a. USE OF PROTECTIVE OINTMENT M5.

(1) Use the M5 ointment immediately after contamination.

(2) Blot drops of liquid war gas from the hose and facepiece. Apply ointment to all external parts with the exception of the eyepieces (ointment causes plastic lenses to cloud) and apply internally and externally to the carrier where spotted with liquid contaminant.

(3) Remove ointment after 15 minutes.

(4) Wash eyepieces with G. I. soap; polish, and treat with antidim. If contamination of eyepieces has caused them to corrode, the mask should be replaced as soon as practicable.

(5) Dispose of all cloths or other materials used to blot.

(6) If additional protection is required, wear mask with ointment applied to its inner surface, but keep ointment out of the eyes.

b. AERATION. If lightly contaminated by vapor or small drops, gas masks may be removed from their carriers and aired in the sun and wind at every opportunity. Always protect canisters against entrance of moisture. If it is necessary that masks be on the person, sling them with facepiece and hose over the shoulder and with canister in the opened carrier.

c. WASHING. Moderately contaminated surfaces of the mask are

thoroughly washed with soap and cool or lukewarm water. Take care to keep water out of the canister during washing.

d. SOAKING IN WATER. Moderately contaminated natural rubber facepieces and hose may be effectively decontaminated by soaking in boiling water for 3 hours if plastic eyepieces and outlet valves are removed. (See TM 3–220.) For heavily contaminated facepieces, soak in boiling water for 6 to 8 hours. Test for war gas and repeat if necessary. In the field, if tools and equipment are not available for removing and replacing plastic parts, the soaking process is not practicable. If plastic parts are removable, wash them repeatedly with soap and water.

e. BURNING AND BURYING. If masks are heavily contaminated and impracticable to treat, obtain new masks and burn or bury the ruined ones.

Section II. FIELD INSPECTION

69. General

Inspections made for the purpose of determining the serviceability of used gas masks fall into two main classifications:

a. BULK INSPECTION is ordinarily done in connection with salvaging or repairing of gas masks. It is done by chemical depot personnel, by chemical maintenance units, or by regimental or battalion gas officers or gas noncommissioned officers.

b. INDIVIDUAL INSPECTION varies in effectiveness depending upon the carefulness of the individual. The inspection may be made as a part of the informal daily training or as a part of the periodic inspection in connection with gas mask drill carried out by the company or other unit commander (FM 21–40).

70. Bulk Inspection

History of the masks (possible contamination by blister gases, exposure to water, and other details) is obtained. The lot is then tagged. Unserviceable masks are sent to the maintenance unit. Inspectors check each component of the equipment after decontamination (if decontamination has been necessary) and discard or repair the equipment as authorized.

71. Individual Inspection

Each individual is responsible for the condition of his own gas mask. He must see that the facepiece collapses when he inhales with the air supply shut off. He must also make a minute visual inspection as explained in FM 21–40. This inspection includes examination of canister and canister straps, antidim, hose and hose connections, eyepieces, outlet valve, and head harness. All defects are reported. Minor defects can be repaired in the organization; major defects require replacement.

CHAPTER 7

EQUIPMENT USED FOR MAINTENANCE OF GAS MASKS

72. General

Categories of maintenance for gas masks conform to standard Army practice. Maintenance equipment included in this chapter is for the performance of organizational maintenance only.

a. ORGANIZATIONAL MAINTENANCE (incorporating 1st and 2d echelon) consist of maintenance performed by individuals or organizations on their own equipment.

b. FIELD MAINTENANCE (incorporating 3rd and 4th echelon) is maintenance performed by mobile and semimobile organizations or in shops on equipment for return to using organizations, station stocks, or replacement pools. Field maintenance also includes rebuilding of major items, as authorized.

c. DEPOT MAINTENANCE (5th echelon) is maintenance beyond the capabilities of the lower echelons performed in fixed installations, and consists of repair and rebuilding of equipment for return to depot stock.

73. Company Gas Mask Repair Kits

Company gas mask repair kits M3 (fig. 62) and MII (fig. 63) are used in effecting minor field repairs necessitated by small holes or tears in the facepiece of the gas mask.

74. Description of Repair Kits

a. The M3 kit is supplied in a metal container approximately 4 inches high, 3½ inches wide, and 1 inch deep. The kit is closed by a hinged clip which snaps to the bottom of the container. The MII container is a cardboard cylinder approximately 5¼ inches long and 2⅛ inches in diameter. It is closed at the bottom by a metal disk crimped over the edge of the cylinder; the opposite end is fitted with a metal sleeve, threaded to receive a metal screw cap.

b. The M3 kit contains a collapsible metal tube of rubber cement; a roll of adhesive fabric ⅞ inch wide and 109 inches long; and a piece of grade 1 or 1½ emery cloth 3½ inches wide by 11 inches long, for the purpose of buffing the area to be patched. The emery cloth is folded with abrasive sides together and lies inside

Figure 62. Company gas mask repair kit M3.

Figure 63. Company gas mask repair kit MII.

of the container; the tube of rubber cement and roll of adhesive fabric stand upright when packed. The MII kit contains a roll of olive drab, bias tape adhesive fabric, wrapped in wax paper. This is packed in the bottom of the container. Above the tape is a collapsible metal tube of rubber cement.

c. Labels on the outsides of both the M3 and MII containers give directions for use. (Surface to receive the patching tape should be well buffed before the cement is applied.)

75. Universal Gas Mask Repair Tool Set M8

The universal gas mask repair tool set M8 (fig. 64) is used for all gas mask repairs that regimental and battalion gas noncommissioned officers are authorized to make. It contains only the tools required for making repairs; repair parts are furnished through supply channels.

76. Description of Repair Tool Set

Each tool set in its individual tool roll of olive-drab waterproofed duck is folded to a flat packet approximately 9½ inches long, 6¾ inches wide, and 2¾ inches thick. The items contained in the set are—

Identifying number	*Item*
1	TM 3–205, The Gas Mask
2	Screw driver, ¼- by 2-inch blade, integral handle
3	Pliers, side cutting, 6-inch
4	Shears, 6-inch, straight trimmers
10	Die, button
11	Hammer, ball-peen, 12-ounce, machinist's, 9-inch overall length
12	Set, tool
13	Punch, cutting, single-bow, 7/64-inch
14	Holder, tool
14	Drill, twist, carbon steel, straight shank, short, 7/32-inch (modified)
15	Kit, sewing
31	Tool, eyering hook

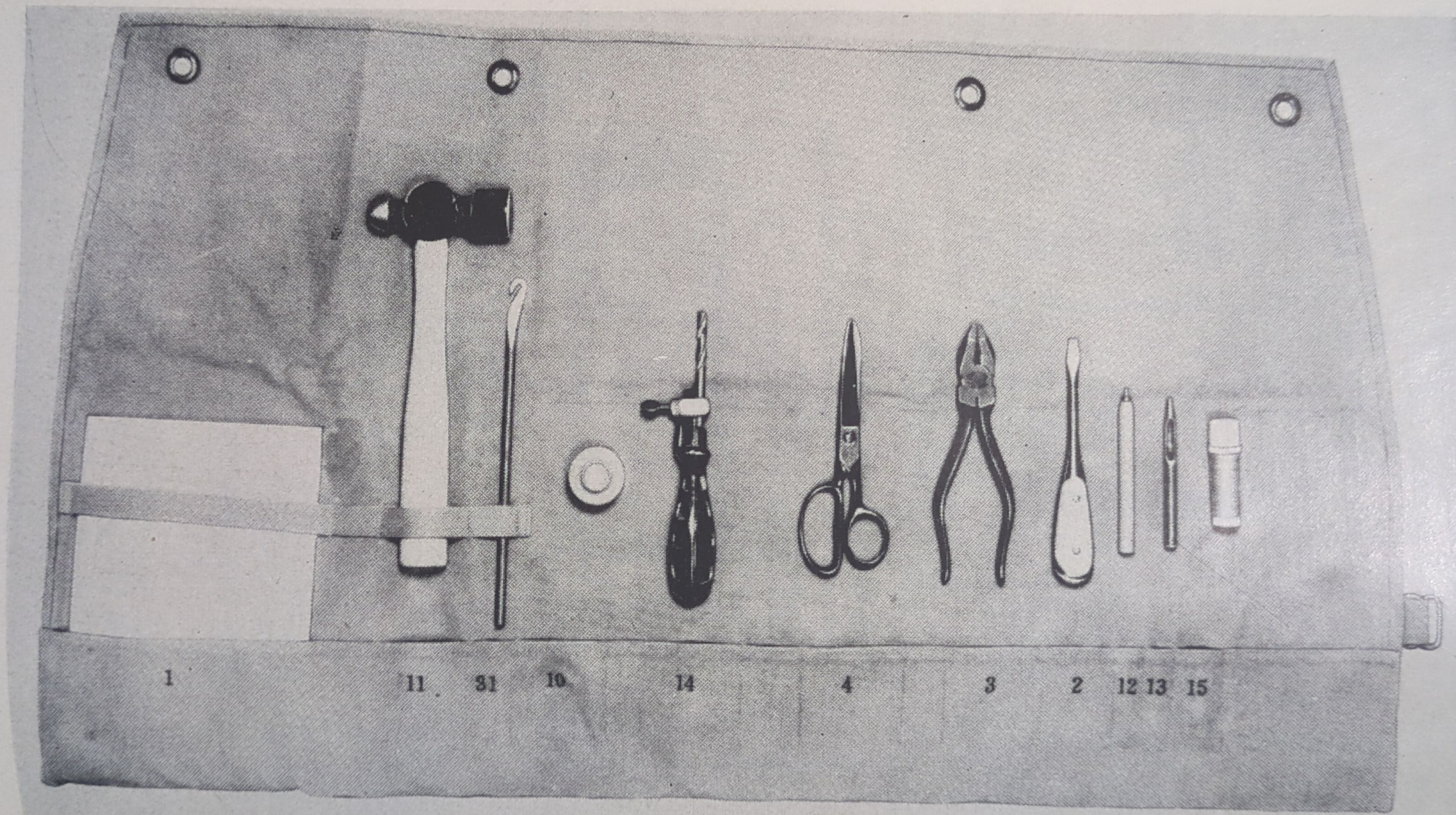


Figure 64. Universal gas mask repair tool set M8.

CHAPTER 8

MAINTENANCE AND REPAIR

Section I. FIELD REPAIRS

77. General

Organizational gas mask maintenance (par. 72) is accomplished by the individual on his own mask or is performed or supervised by company, regiment, or separate battalion personnel who have been trained for organizational maintenance in gas noncommissioned officers' schools.

78. Maintenance Permissible to the Individual

The individual wearer—

a. Cleans his mask when necessary and applies antidim to the lenses.

b. At scheduled intervals, inspects his mask for tears and holes.

c. Notifies the proper authority of any damage that calls for repair or replacement of parts.

d. Protects his mask from cold set (par. 65).

79. Repairs Permissible to Company

Company gas noncommissioned officers repair all minor defects that they can with materials furnished in the M3 or MII company gas mask repair kit. Gas masks requiring more detailed repairs are sent to higher levels of maintenance.

80. Repairs Permissible to Regiment or Battalion

Gas masks are repaired in regiments and separate battalions to the extent authorized by Chief Chemical Officer and Theater Chemical Officer and within limitations imposed by allowances of spare parts and repair facilities. Unit gas officers supervise repairs and are assisted by unit gas noncommissioned officers. Maintenance units will effect gas mask repairs which are not authorized at organizational level. Gas mask repairs listed in *a* through *l* below are made within the unit, depending on policy and allowances of tools and spare parts.

a. ANGLETUBE. Removing and replacing angletube of facepiece assembly M2 of lightweight optical gas masks.

b. CANISTER MOUNTING PIECE. Removing and replacing canister mounting piece of the M9 gas mask and the headwound gas mask.

c. CANISTER MOUNTING ADAPTER. Removing and replacing canister mounting adapter of the snout-type service gas mask.

d. EYEPIECES. Removing and replacing all triangular eyerings and lenses of facepiece assemblies.

e. FACEBLANK PATCHING. Patching small cuts, tears, or punctures in the molded rubber faceblanks.

f. HEAD HARNESS. Repairing or replacing all head harnesses.

g. TAB ASSEMBLIES. Removing and replacing tab assemblies of all molded rubber faceblanks.

h. NOSE-CUPS. Removing, replacing, and fitting nose-cups.

i. OUTLET VALVES. Removing and replacing all outlet valves.

j. HOSE. Removing, replacing, and minor patching.

k. CANISTERS. Removing and replacing all canisters.

l. CARRIERS. Making minor emergency repairs.

81. Repairs Not Authorized

Without special authorization from the Chief Chemical Officer, the following repairs are not authorized and are not to be made in the field:

a. Any repair involving disassembly of a canister—repairing or replacing a filter or chemicals.

b. Replacement of the lenses in the optical facepiece M2 and replacement of the eyepieces of the headwound hood assembly M7 and the dog muzzlepiece M6.

Note. Repairs listed as unauthorized may be made in especially equipped higher maintenance categories, designated by the Chief Chemical Officer.

Section II. ORGANIZATION AND TRAINING OF REPAIR PERSONNEL

82. General

Gas mask repair personnel (organizational maintenance level) consist of company, regimental, or battalion gas noncommissioned officers under the supervision of unit gas officers trained in their duties in schools established for the purpose.

83. Unit Gas Noncommissioned Officers

Personnel required to assist trained gas noncommissioned officers are drawn from the unit concerned, and are trained and supervised by the noncommissioned officers charged with the repairs. Temporary repair teams may be organized using the organization

of T/O&E 3–47 and T/O&E 3–500 as a guide. Circumstances determine the number of men needed and the type of work they do. Gas masks requiring repairs too extensive, involved, or difficult to be made with the authorized company repair kit or the regimental M8 repair kit should be forwarded to higher levels of maintenance.

Section III. REPAIR PROCEDURES COMMON TO ALL MASKS

84. General

This section describes general repair procedures common to all masks. All repair procedures call for the replacement of worn or damaged parts with new parts, and the testing of masks for serviceability after they have been repaired.

85. Initial Taping of Part

When a hose is attached to a canister or facepiece stem, or an outlet valve or mounting piece is attached to a stem provided for the purpose, apply 1¼ turns of nonsurgical adhesive tape as a base for the clamping wire. Figure 65 shows the application of tape over the hose, which has been placed over the canister nozzle. Tape should be smooth and evenly wrapped.

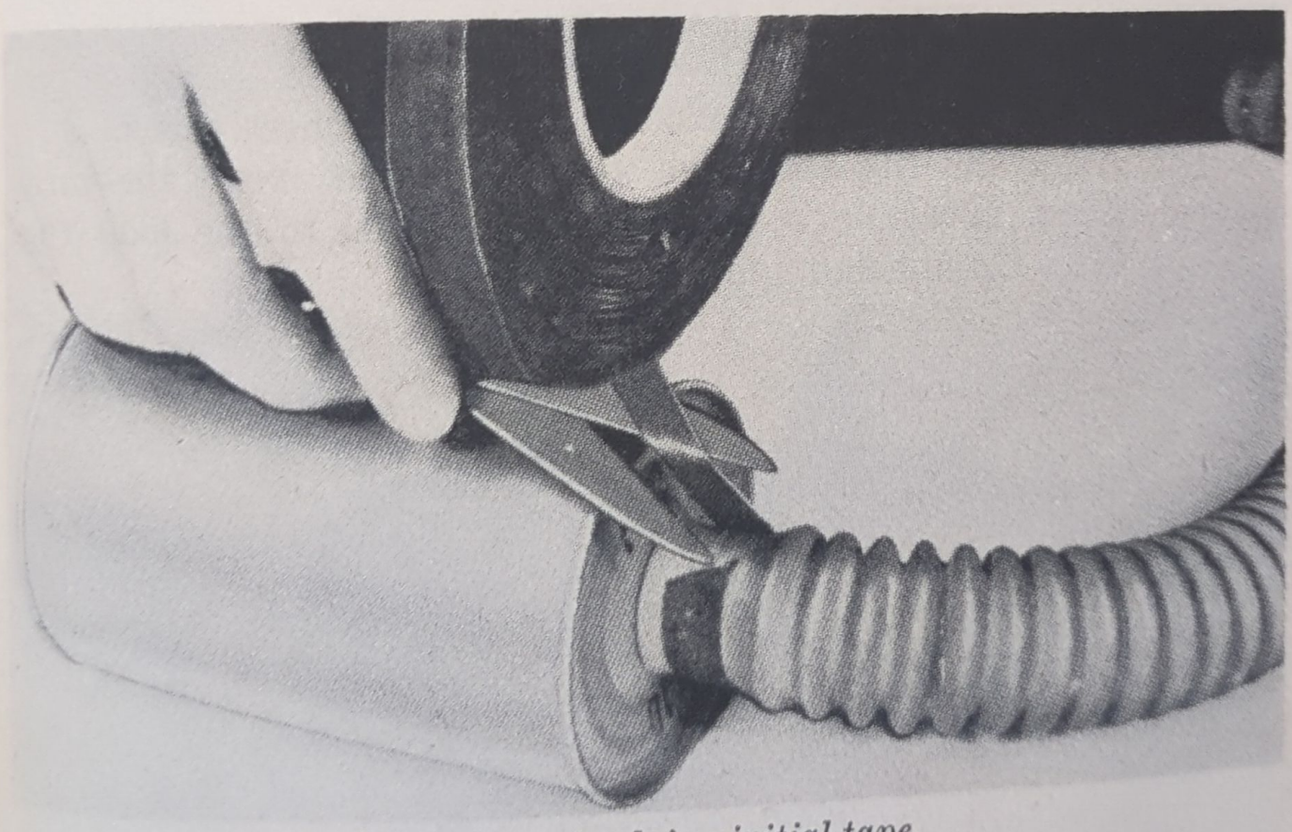


Figure 65. Applying initial tape.

86. Applying Wire Clamp or Looped Wire

a. GENERAL. Wire clamps are now furnished as binding wires for repair of the gas masks; however, looped wires have been used on many masks which are now in the field. When wire clamps cannot be supplied, looped wire will be used. Reference in later para-

graphs is made only to wire clamps. Application of both are given in *b* and *c* below.

b. APPLYING LOOPED WIRE.

(1) When looped wire is used as a binding wire, place it on the initial taping. Obtain correct tension by grasping wire ends with pliers; pull loop tight, twisting it to take up the slack (fig. 66).

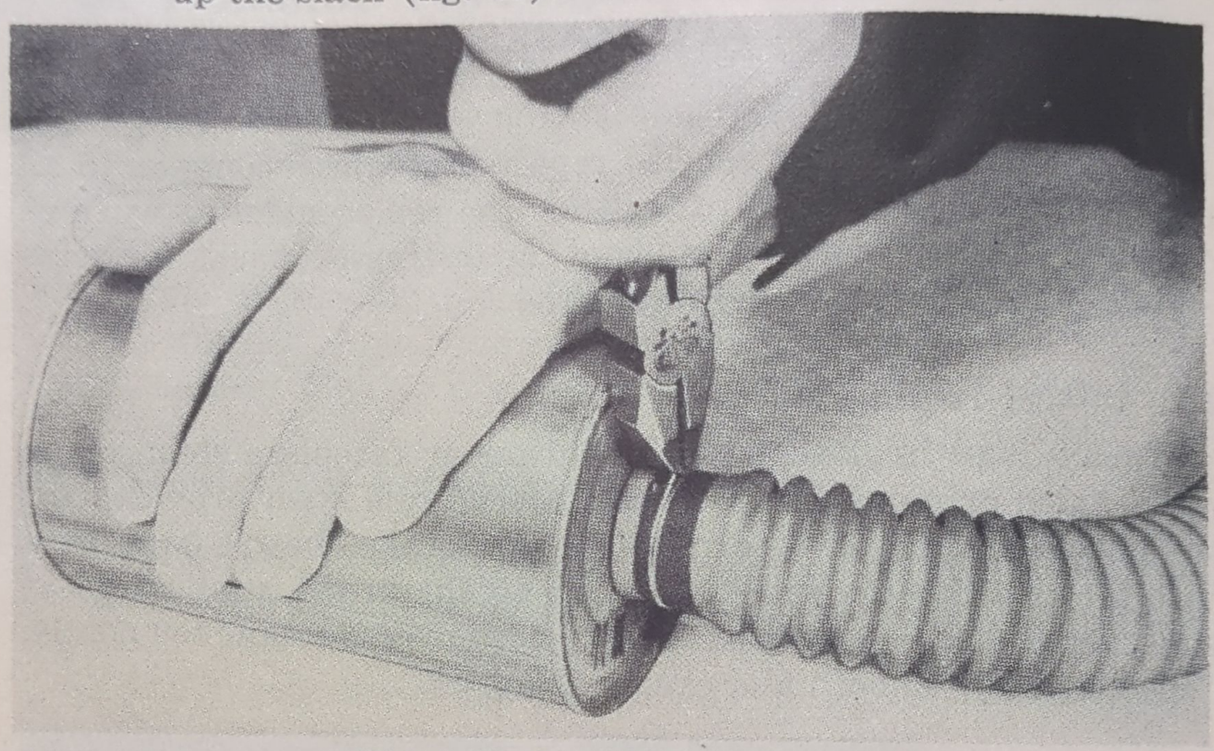


Figure 66. Applying looped wire.

(2) Carefully cut off all excess wire except three turns.

(3) After cutting the wire at three turns, bend the turns down carefully alongside and parallel to the loop (fig. 67). Do not damage or cut the tape.

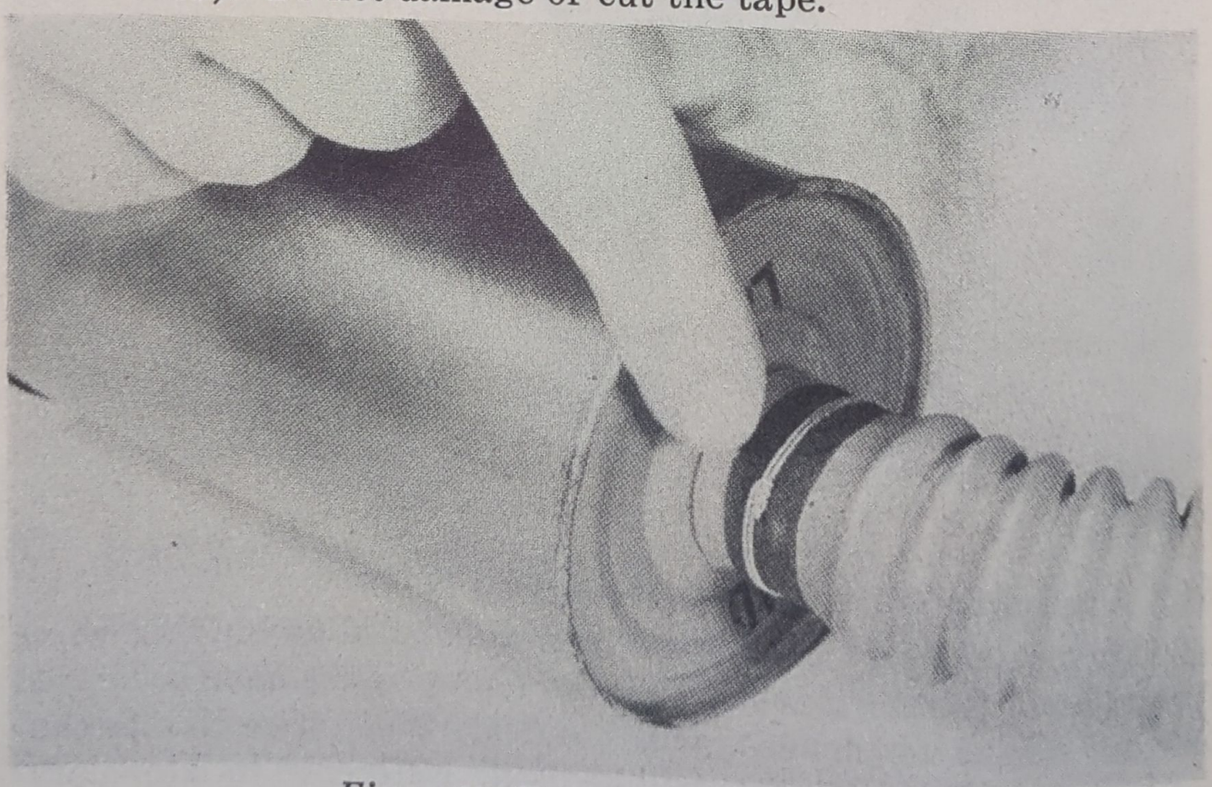


Figure 67. Wire bent into position.

c. APPLYING WIRE CLAMP.

(1) When wire clamp is used as a binding wire, place it on the initial taping.

(2) Insert a hooked tool (CmlC drawing C5–11–163) through the larger loop of the clamp into the smaller or bent loop.

(3) Engage the bent looped end of the clamp with the hook of the tool (fig. 68) and tighten the wire clamp by moving the tool so as to draw the bent loop through the larger loop. When the tool can be forced no farther, remove it.

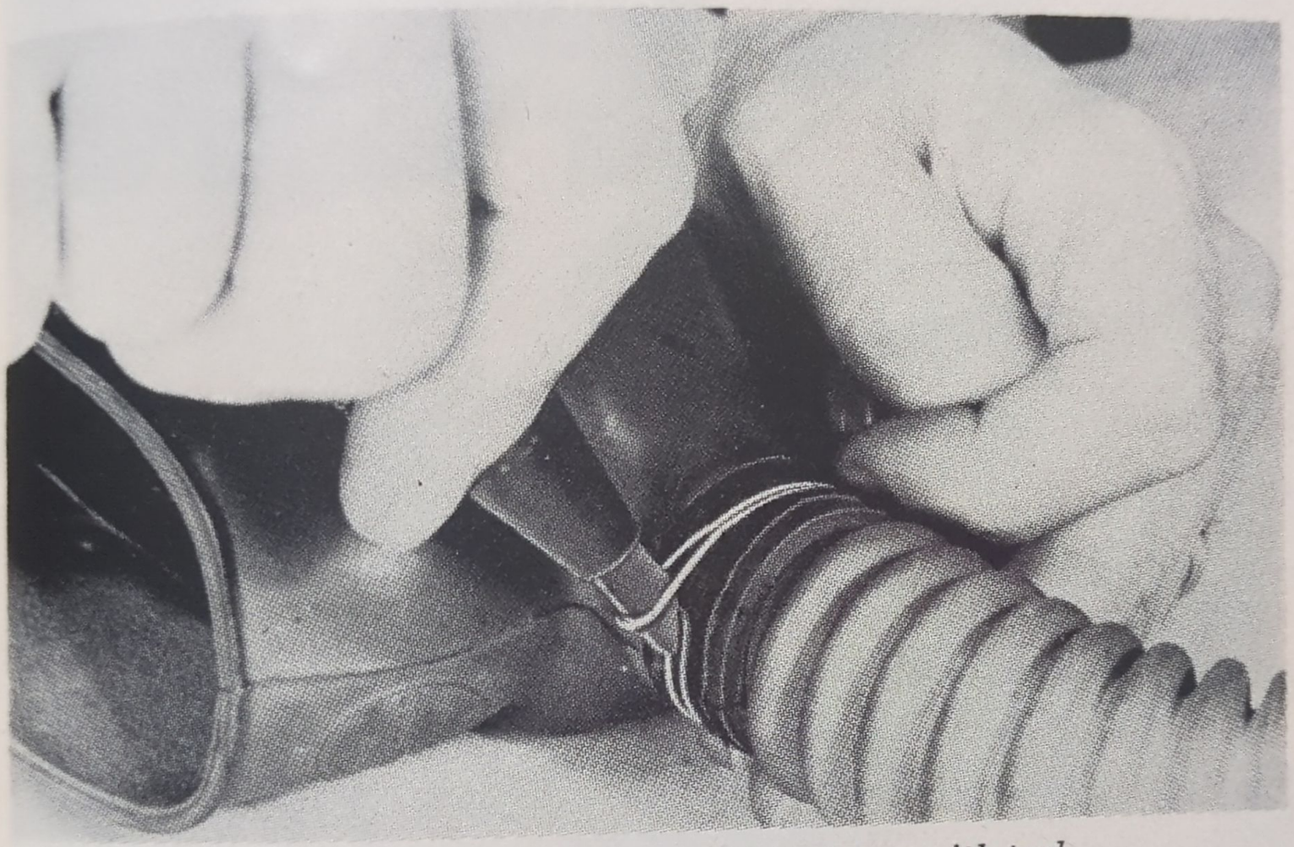


Figure 68. Engaging looped end of clamp with tool.

(4) Insert the opposite end of the tool into the smaller loop, in the side opposite that from which the hooked end was withdrawn.

(5) Press the loop back against the wire and withdraw the tool (fig. 69).

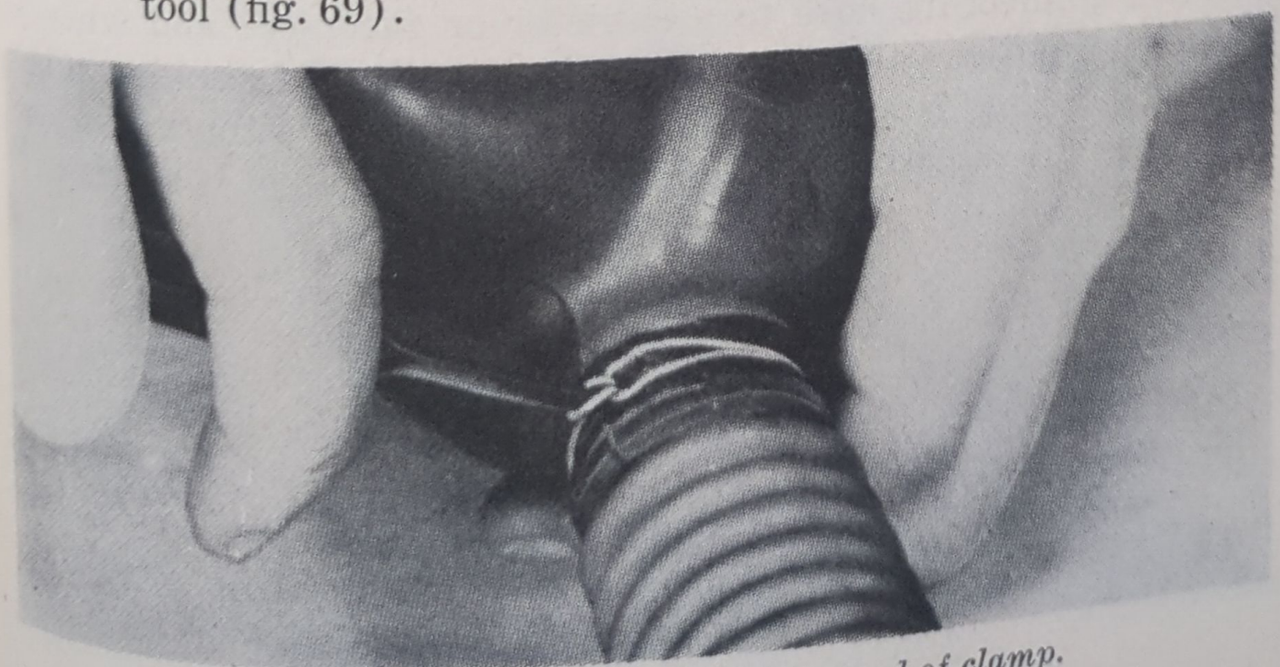


Figure 69. Pressing down protruding end of clamp.

87. Placing Outer Layer of Tape

After the wire clamp has been secured in place, apply 1¼ turns of nonsurgical adhesive tape over the wire clamp so that the overlapping quarter turn provides a double layer of tape at the point where the clamp is bent (fig. 70).

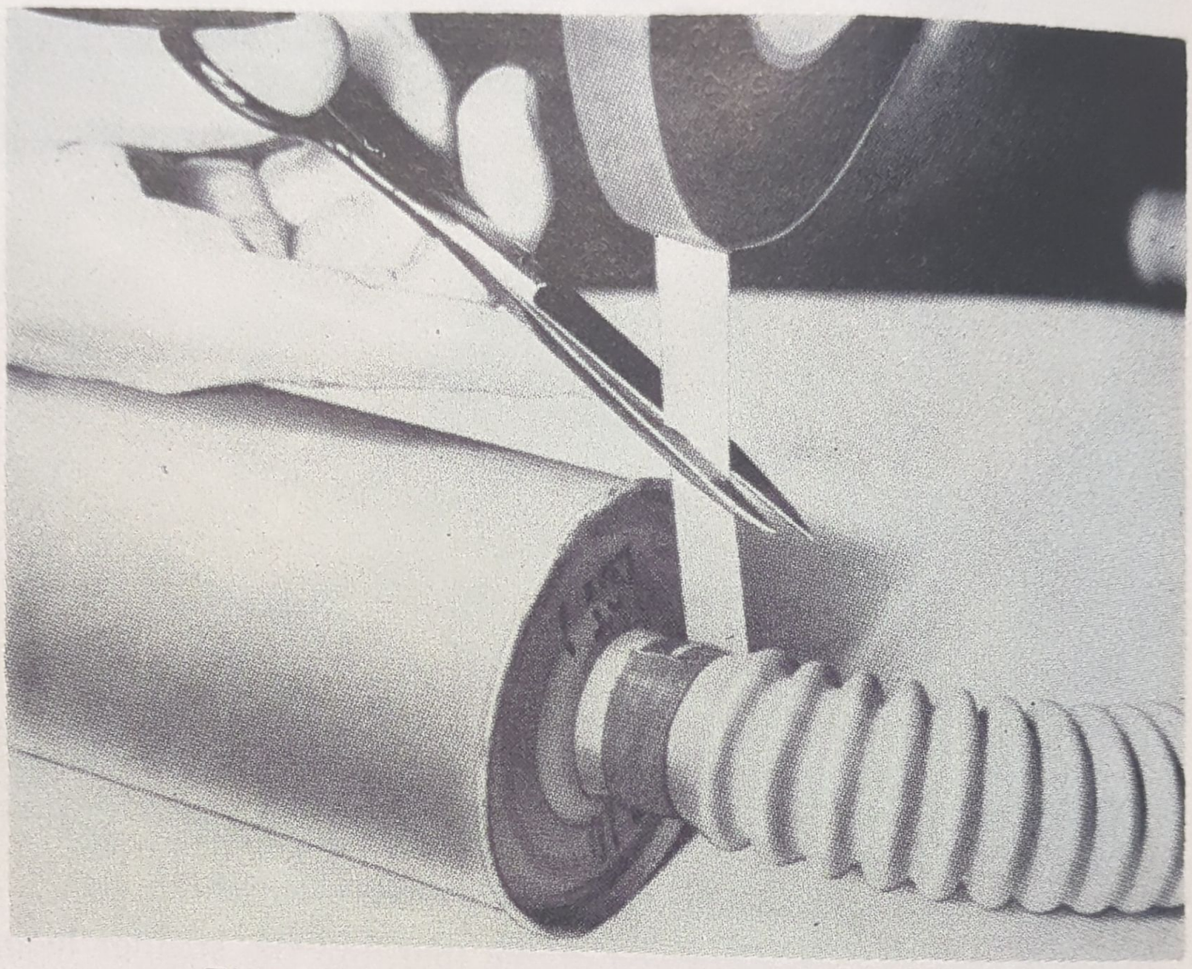


Figure 70. Applying outer layer of tape over clamp.

88. Application of Lubricant

When connecting hose to a canister or facepiece and when installing an outlet valve in outlet valve nozzle of facepiece, rubber cement or water is often used as a lubricant. If rubber cement is used, the part must be inserted while rubber cement is still wet.

CHAPTER 9
REPAIR PROCEDURES

89. General

This chapter describes repair procedures that may be carried out in the field. Although both removal and replacement procedures for components are included, repair and replacement of parts are governed by existing authorization in effect at the time of performance.

90. Angletube

a. GENERAL. The angletube is a component of the optical facepiece assembly M2.

b. REMOVAL.

(1) Remove outer layer of adhesive tape from nozzle of facepiece.
(2) Uncouple and remove wire clamp.
(3) Remove layer of adhesive tape which was under the wire clamp.
(4) Carefully loosen angletube with a screw driver and withdraw angletube from facepiece (fig. 71).

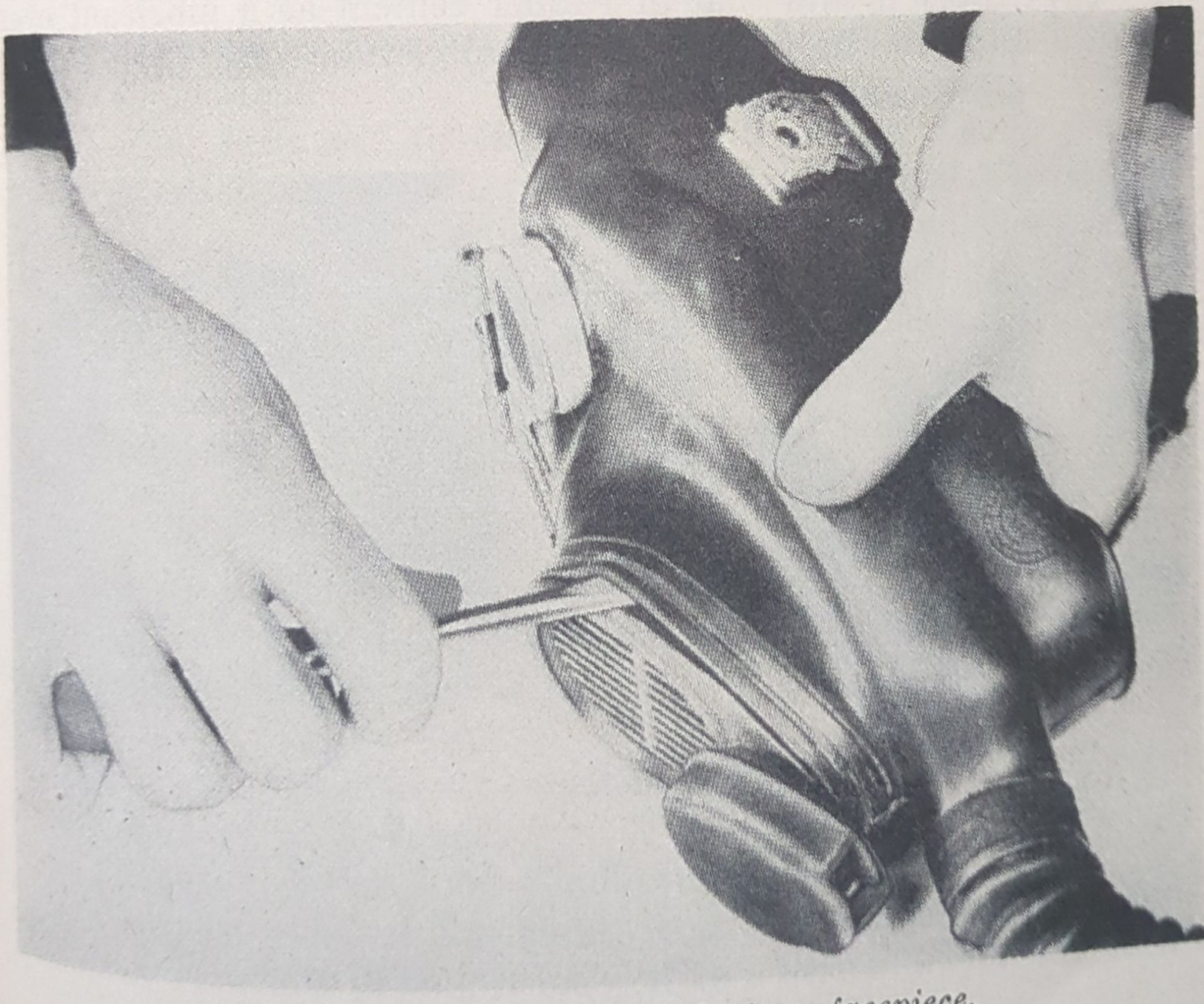


Figure 71. Loosening angletube from facepiece.

c. REPLACEMENT.

(1) Apply a layer of 3/8-inch adhesive tape around groove of new angletube with edge of tape covering inner flange of angletube (fig. 72).

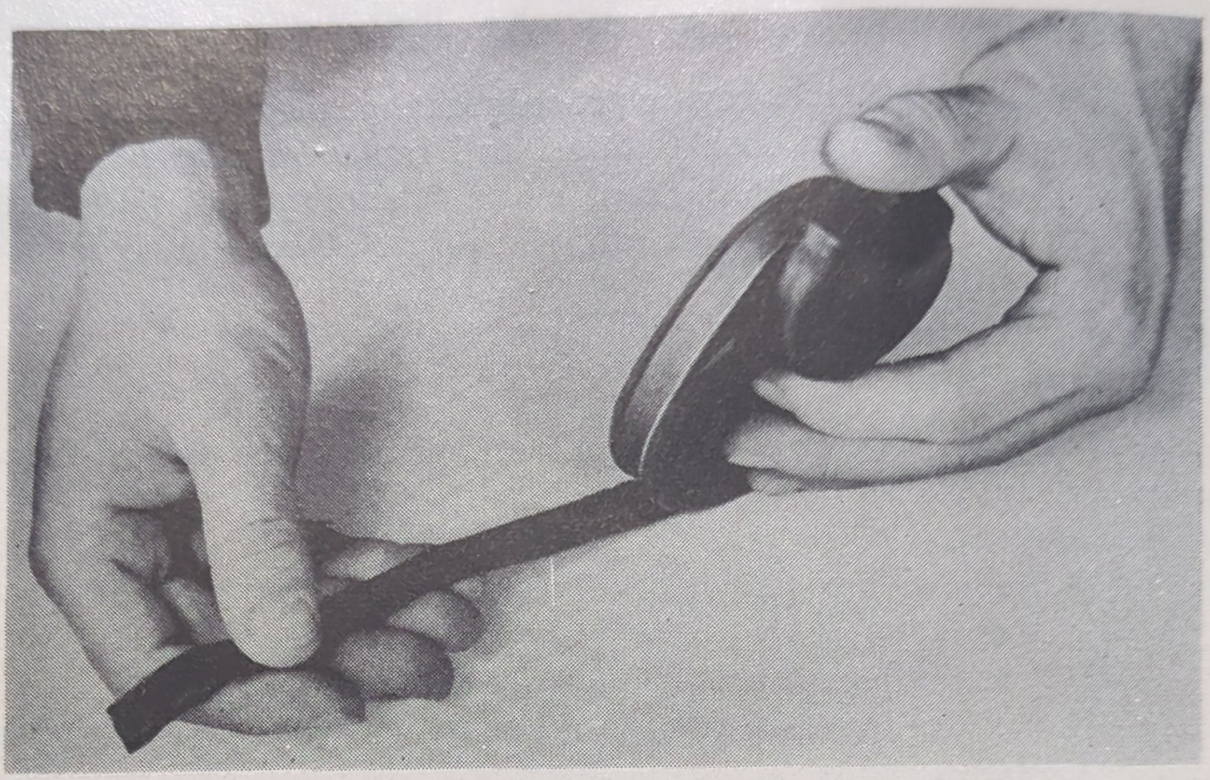


Figure 72. Applying adhesive tape around groove of angletube.

(2) Apply a thin coat of rubber cement as a lubricant over tape in the groove around angletube (fig. 73). Do not allow cement to dry.

Figure 73. Applying rubber cement.

(3) Immediately insert angletube in nozzle of facepiece and aline in the facepiece (fig. 74).

Figure 74. Inserting and alining angletube.

(4) Apply 1¼ turns of ⅜-inch adhesive tape around nozzle of facepiece over groove of angletube with the overlap at the bottom.
(5) Bind facepiece to angletube with a wire clamp placed over the tape around nozzle of facepiece. Place wire clamp so that joint of clamp is at the bottom over the overlap of the tape.
(6) Cover wire with 1¼ turns of ⅜-inch adhesive tape so that overlap is over joint of the clamp.
(7) Test mask for leakage as prescribed in FM 21–40.

91. Canister Mounting Piece

a. GENERAL. The canister mounting piece for the M11 canister is a component of the facepiece assemblies for the M9 gas mask and the headwound gas mask.

b. REMOVAL.

(1) Remove outer layer of adhesive tape.
(2) Remove wire clamp.
(3) Remove bottom layer of adhesive tape.
(4) Release stem of faceblank from around mounting piece by carefully prying it loose with a screw driver and then removing the mounting piece (fig. 75).

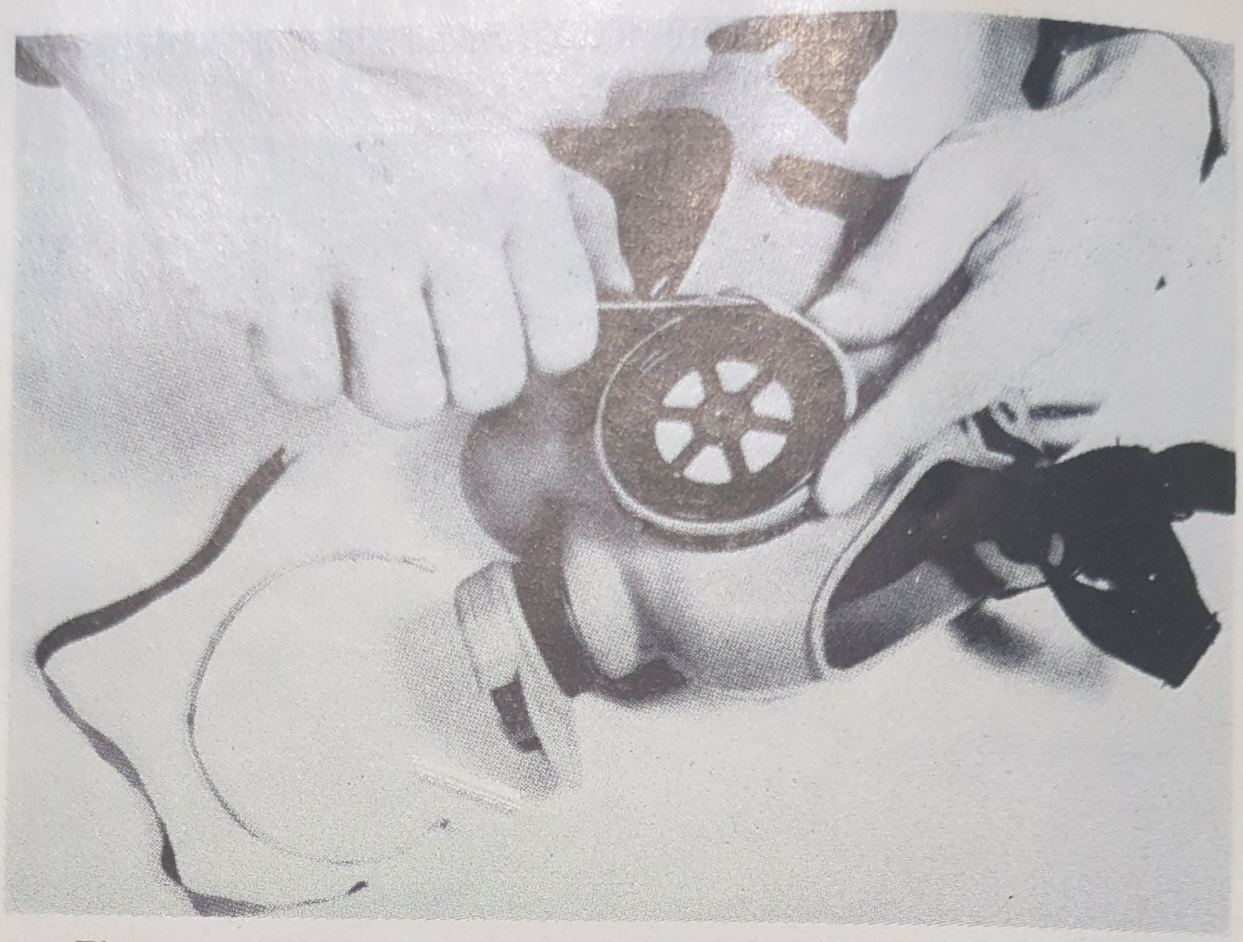


Figure 75. Releasing stem of faceblank from canister mounting piece.

c. REPLACEMENT.

(1) Wipe a thin coat of rubber cement around inside of stem on faceblank to receive the canister mounting piece.

(2) Insert mounting piece into stem so that edge of stem is even with outer edge of mounting piece.

(3) Apply 1¼ turns of ⅜-inch adhesive tape around overlap of stem of faceblank and stem of mounting piece.

(4) Bind faceblank stem to mounting piece with a wire clamp. Place clamp over adhesive tape which is wrapped around the stem so that the joint is over the tape overlap. Tighten the wire clamp.

(5) Cover wire clamp with 1¼ turns of ⅜-inch adhesive tape overlapped at the joint of the clamp.

(6) Test mask for leakage as prescribed in FM 21–40.

Note. Procedure for replacing canister mounting piece in the headwound gas mask is identical to above procedure; however, instead of adhesive tape, use ⅜-inch plastic adhesive cellulose acetate tape.

92. Canister Mounting Adapter

a. GENERAL. The canister mounting adapter for the M11 canister is a component of the facepiece assembly of the snout-type service mask.

b. REMOVAL.

(1) Remove outer layer of adhesive tape.

(2) Remove wire clamp.

(3) Remove bottom layer of adhesive tape.

(4) Carefully release faceblank stem from adapter by working around the joined surfaces with a screw driver to assist in withdrawing adapter from faceblank stem (fig. 76).

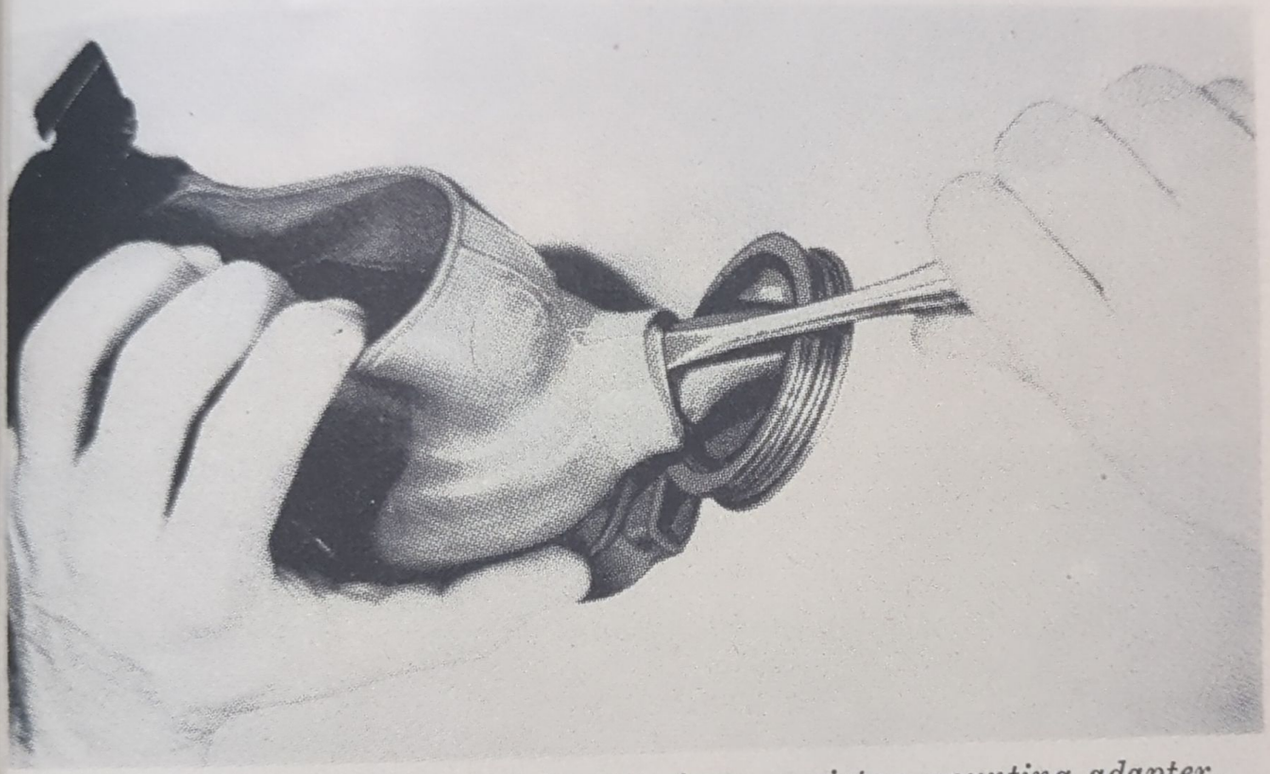


Figure 76. Releasing faceblank stem from canister mounting adapter.

c. REPLACEMENT.

(1) Wipe a thin coat of rubber cement (par. 88) on the adapter stem.

(2) Insert new canister mounting adapter in faceblank stem until end of stem contacts body of adapter.

(3) Aline adapter to its correct symmetrical position with relation to the facepiece (fig. 77).

(4) Apply 1¼ turns of ⅜-inch adhesive tape around overlap of facepiece stem and adapter.

(5) Place a wire clamp over the adhesive tape wrapped around the stem so that the joint is over the tape overlap. Tighten wire clamp (par. 86).

(6) Apply 1¼ turns of ⅜-inch adhesive tape over the clamp, overlapping it at the joint.

(7) Test mask for leakage as prescribed in FM 21–40.

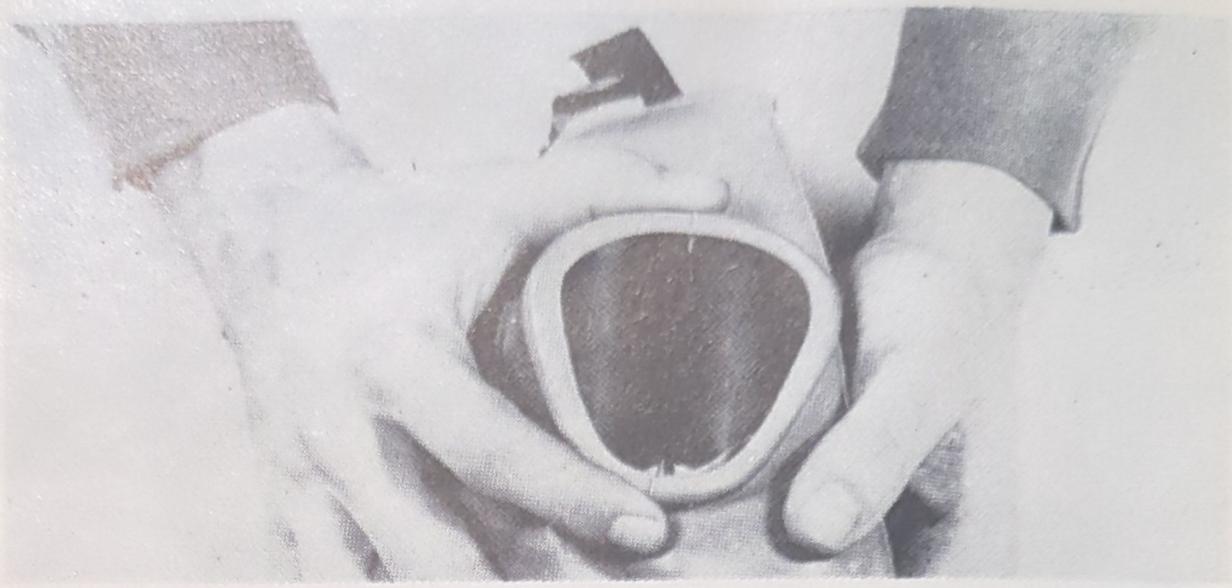


Figure 80. Alining check points on faceblank and lens.

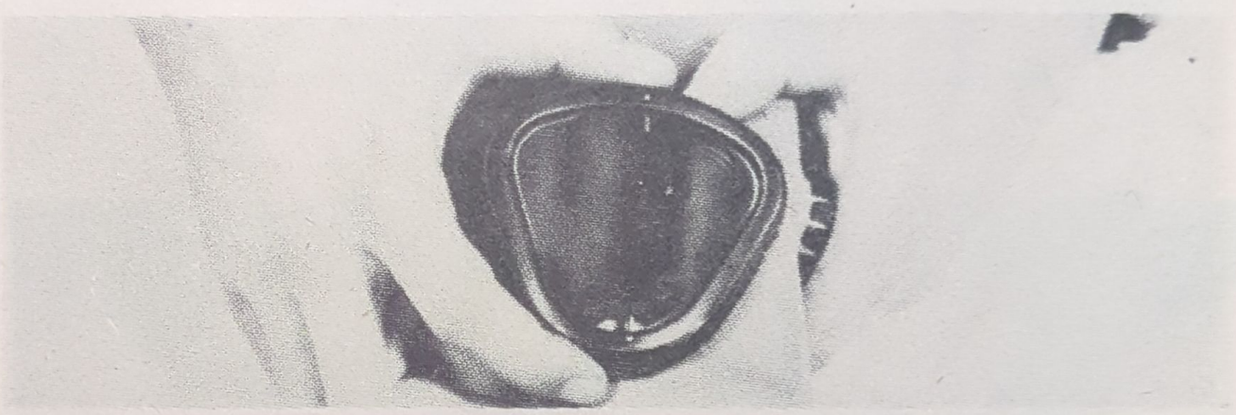


Figure 81. Alining check points on eyering with check points on faceblank and lens.

(5) Crimp two tabs at each corner of eyering (fig. 82).

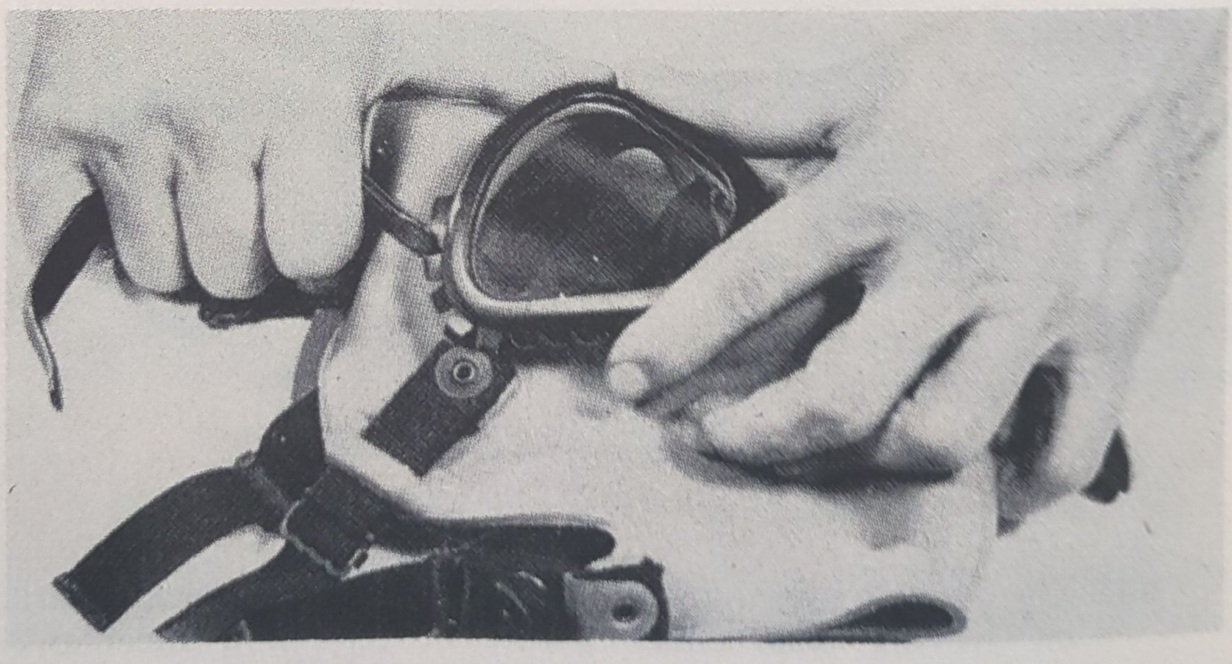


Figure 82. Crimping corner tabs of eyering.

(6) Check alinement of eyering, faceblank, and lens through the check points and, if correct, crimp down all tabs of eyering. Take care not to damage the faceblank or the coating of the eyering. Make sure that no rubber shows between metal ring and lens.

(7) Test mask manually for leakage as prescribed in FM 21–40.

c. REMOVAL AND REPLACEMENT OF OPTICAL EYEPIECES. Metal parts of the eyepieces which are replaceable are: two adapters, a right and a left holder, and an adjusting screw. The adjusting screw has a right hand thread on one end and a left hand thread on the opposite end. The screw may become bent or the threads may be damaged to the extent that adjustment of the eyepieces is prevented; if so, these parts should be replaced as follows:

(1) Unscrew adapter from right and left lens. This should be done by hand; however, pliers may be used if adapter is too tight to remove by hand (fig. 83).

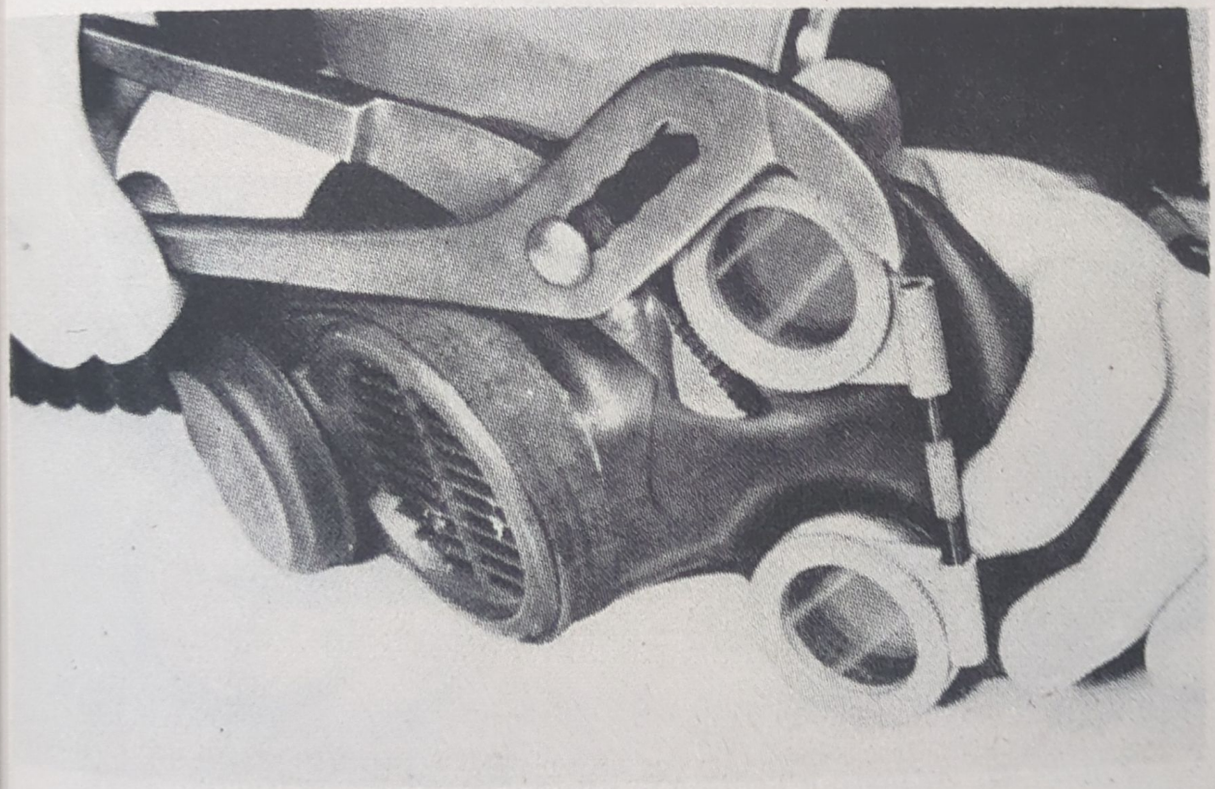


Figure 83. Unscrewing adapter from lens.

(2) Lift the two holders and adjusting screw as a unit from the facepiece (fig. 84).

(3) Unscrew holders from adjusting screw.

(4) Replace damaged parts with new ones and screw holders on adjusting screw to equal distances (fig. 85).

Figure 84. Adapters and holders removed from faceblank.

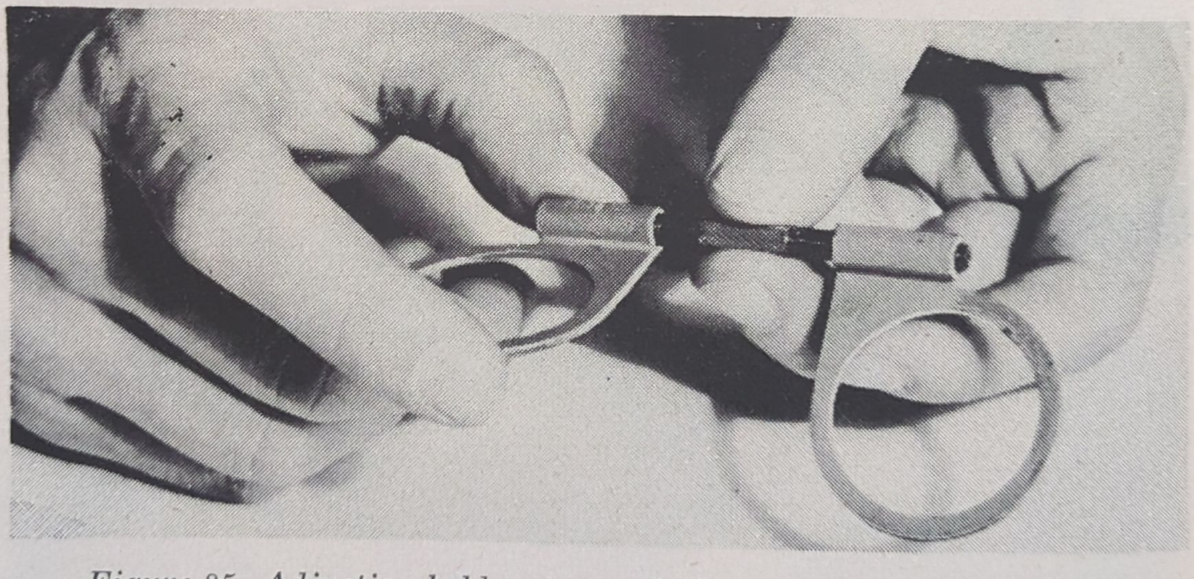


Figure 85. Adjusting holders to equal distances on adjusting screw.

(5) Seat this assembly as a unit over the eyerings.

(6) Replace right and left adapters by screwing them hand-tight (fig. 86).

94. Faceblank Patching

a. GENERAL. All molded rubber faceblanks may be patched. They may be made gastight by the application of patches on both

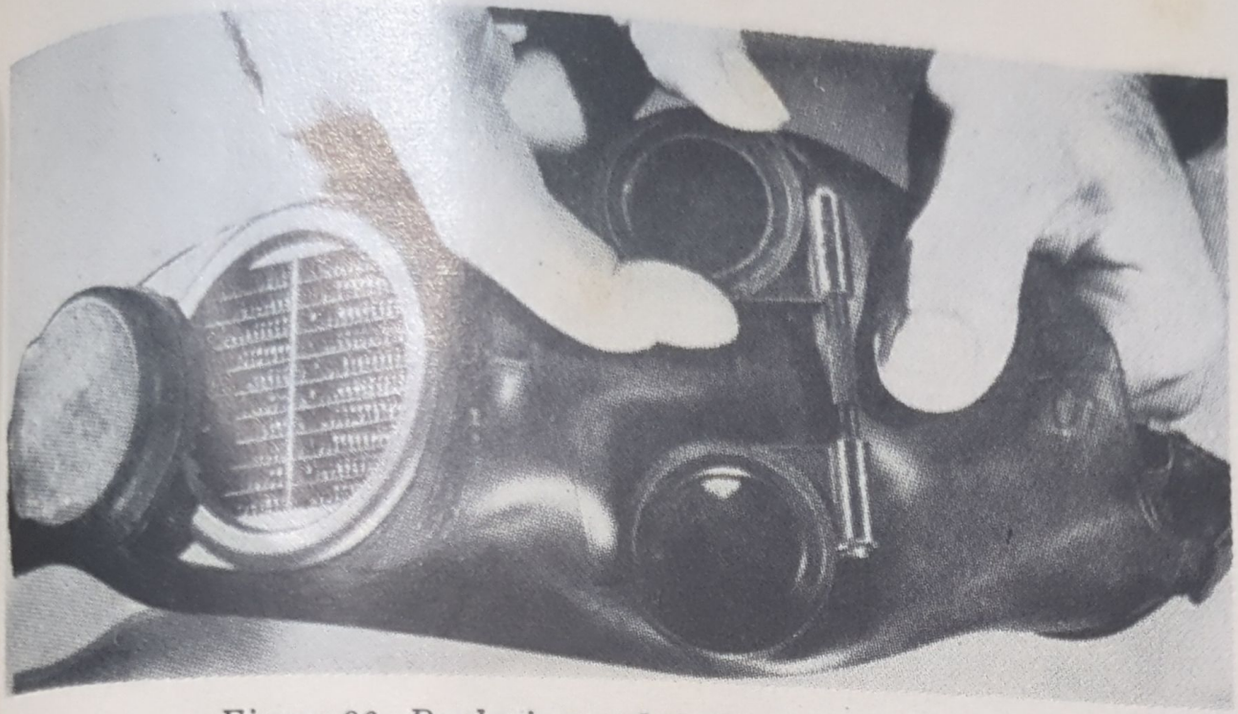


Figure 86. Replacing and tightening adapter.

inner and outer surfaces. Small cuts, tears, or punctures may be patched when they are clear of the deflector tubes, since the patches can then be placed effectively on opposite surfaces of the same piece of rubber. Care should be exercised in patching adjacent punctures so that the patches do not overlap. Incorrect patching may result in channels through which contaminated air is directed to the hole or tear being repaired. Tears at the edge of the faceblank must be carefully inspected after repair to avoid any resultant crack or channel. Patching tears extending to the edge of the faceblank or more than ½ inch in length must be avoided, since the strain of stretching involved in fitting the mask destroys the gastight seal. Defects of this nature require replacement of the facepiece.

b. PATCHING PROCEDURE.

(1) On both the outside and inside of the facepiece, use gasoline, benzene, or other solvent to clean an area around the hole or tear slightly larger than the patch will cover.

(2) Clean and roughen areas to be patched with emery cloth or knife blade.

(3) Apply a coat of rubber cement on each roughened surface and set aside until nearly dry.

(4) Remove the backing from two patches. Place the patch surface of one of the patches directly over the hole to be patched on the outside of the facepiece (fig. 87). Similarly place the second patch directly over the hole on the inside of the facepiece. Press both patches down smoothly with the fingers.

Figure 87. Applying patch directly over hole.

95. Head Harness Replacement

a. Remove old head harness by releasing the straps from the buckles of the tab assemblies or by cutting straps.

b. Place head harness in facepiece so that straps and head pad are properly oriented.

c. Thread ends of harness straps through the buckles of the tab assemblies by inserting the clinch tips at an angle, since the tips are wider than the buckle opening (fig. 88). The strap must come from under the buckle through the slot near the tab attachment. It is then passed over the bar and through the other slot.

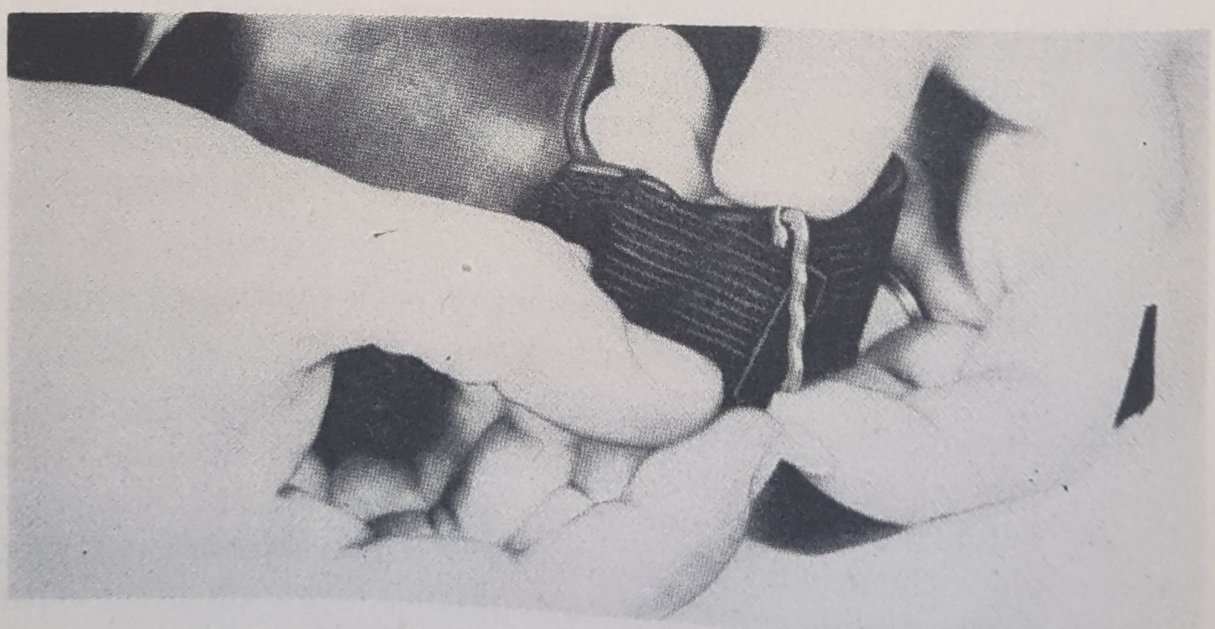


Figure 88. Threading harness strap through buckle.

d. Pull straps through the buckle about 1 inch.
e. Inspect all replacements by stretching head harness at the head pad to see that all straps are of equal tension.
f. Sew minor tears and replace clinch tips.

96. Tab Assemblies

a. GENERAL. Tab assemblies are secured to all molded rubber faceblanks of gas masks to provide an anchorage for the straps of the head harness at the forehead, temple, and cheek positions.

b. REMOVAL.

(1) Place inner part of facepiece down with head of button resting on a hard, flat surface.

(2) With facepiece held firmly, ream out the flanged end of the button with hand drill until button and washer (or clip) fall apart (fig. 89).

(3) Remove button and tab from facepiece.

c. REPLACEMENT.

(1) Lay a new tab on a piece of hard wood. Cut a clean hole on the center line of the tab, 3/8 inch from the end of the tab, using the cutting punch and hammer (fig. 90).

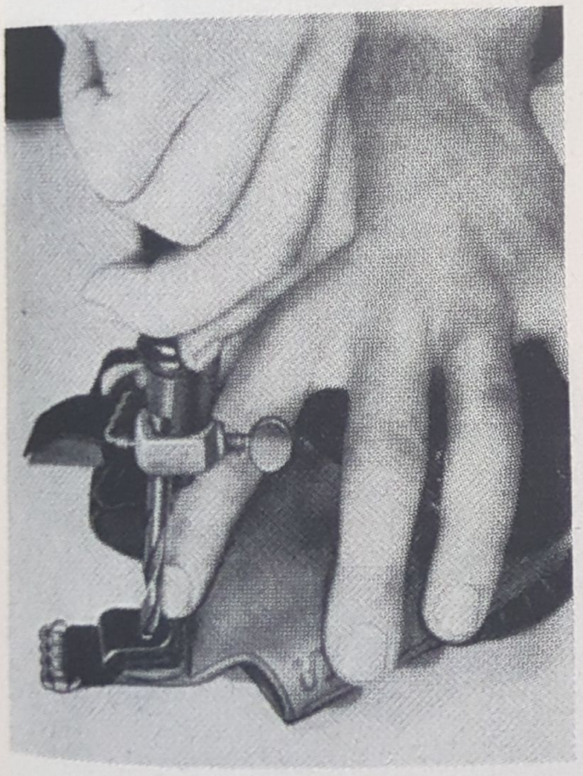


Figure 89. Reaming out flanged end of button.

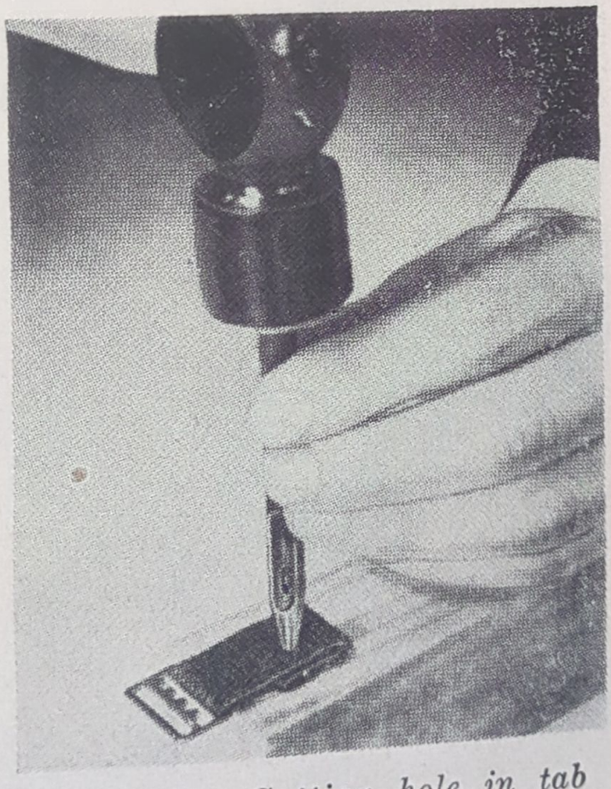


Figure 90. Cutting hole in tab with punch.

(2) Pass the new tab through the bridge (if present) in the faceblank with folded edge of tab toward faceblank. Line up hole in tab with hole in the rubber mound of the faceblank.

(3) From the inside, push neck of a new button through hole in faceblank and in tab (fig. 91).

Figure 91. Pushing neck of button through faceblank and tab.

(4) Place a new washer (or clip, as required) over neck of button, hollow side up, and place head of button in recess of button die (fig. 92).
(5) Rivet clip securely by use of the tool set and hammer (fig. 93).

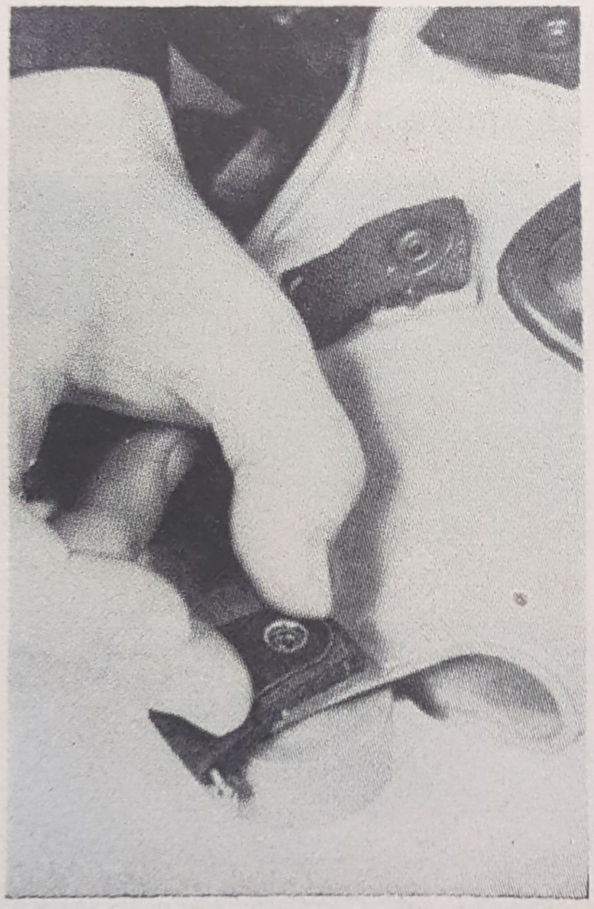


Figure 92. Placing clip over neck of button.

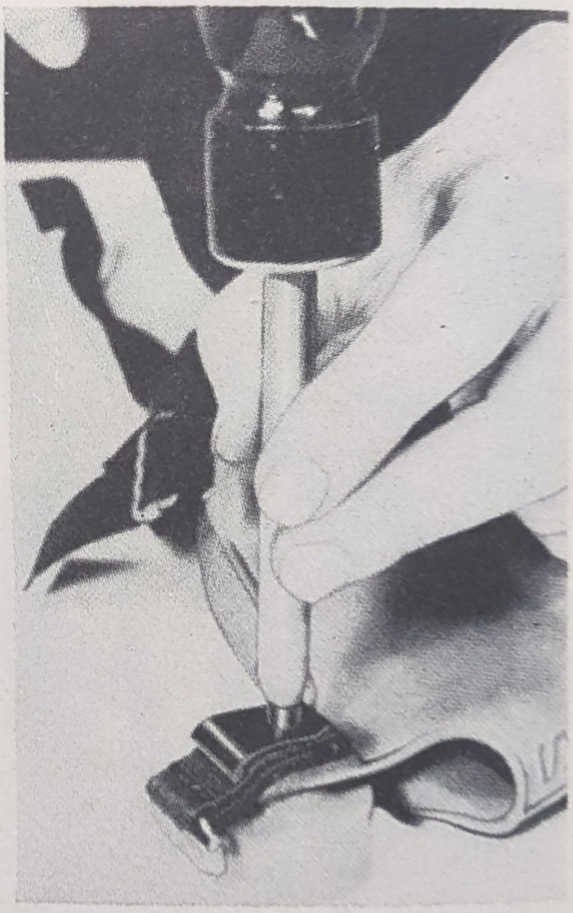


Figure 93. Riveting with tool set and hammer.

97. Nose-Cup

a. GENERAL. Nose-cups are components of the facepiece assemblies of military type gas masks. The nose-cup is fastened in the facepiece by a stem attachment at the outlet valve, and inside the cheek by vulcanizing or by attachment with the button and washer

of the cheek tab assembly. Method used for the inside cheek attachment affects the method of repair.

b. REPLACEMENT BY BUTTON AND WASHER ATTACHMENT.

(1) Remove the cheek tab assemblies as described in paragraph 96*b*, releasing the nose-cup cheek attachment.

(2) Remove outlet valve from outlet valve nozzle of facepiece as described in paragraph 98*a* or *b* depending on the type of outlet valve to be removed.

(3) Release the folded back nose-cup stem from outlet valve nozzle of facepiece, permitting defective nose-cup to be removed from the facepiece.

(4) Insert new nose-cup stem in the outlet valve nozzle and properly aline the nose-cup (fig. 94). Mark locations for punching holes in the nose-cup for cheek attachments by the buttons of the tab assemblies.

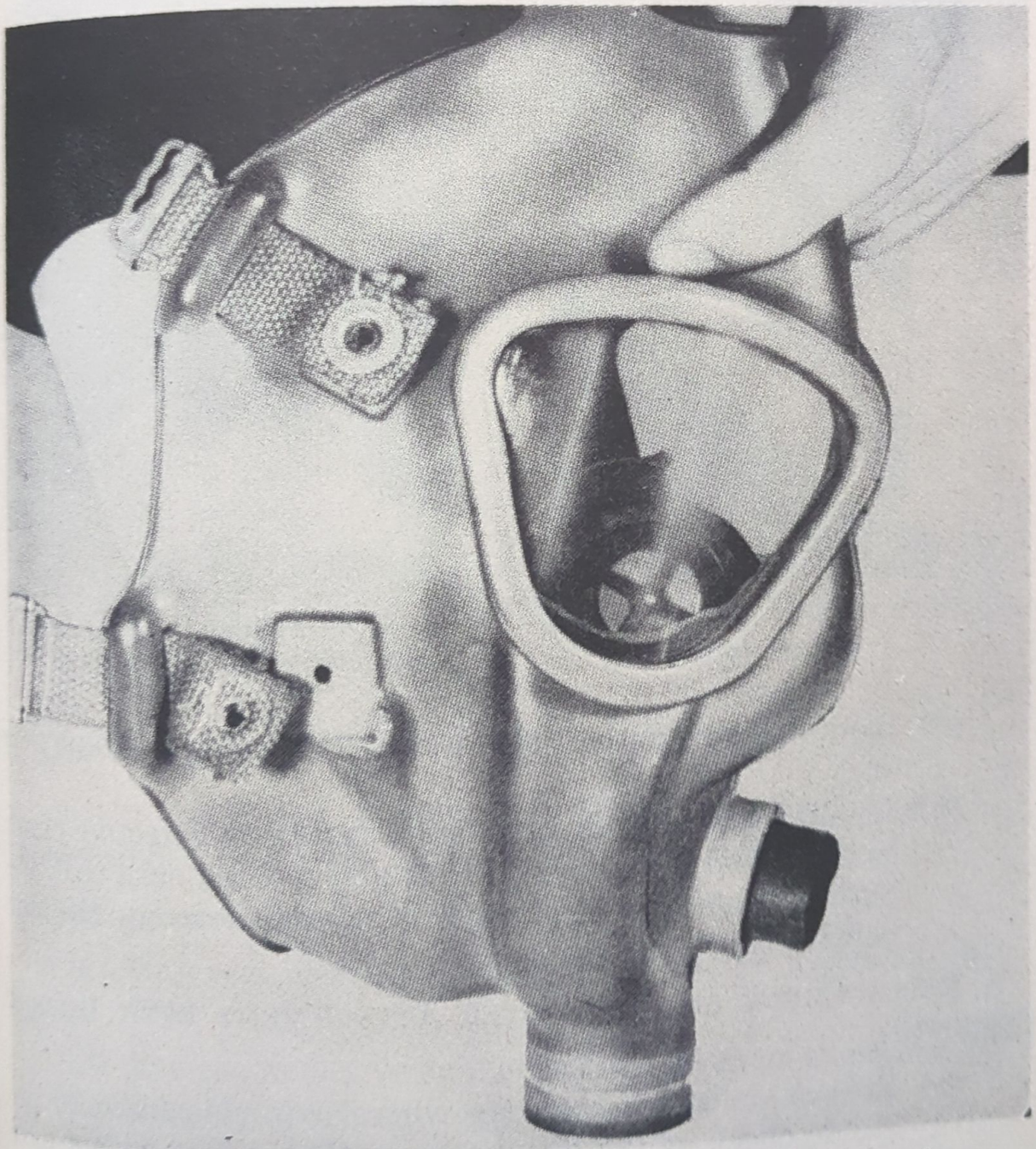


Figure 94. Inserting and alining nose-cup stem in nozzle of facepiece.

(5) Remove marked nose-cup from facepiece. Lay nose-cup to be punched on a block of hard wood. Cut a clean hole through the marked location of the holes with the cutting punch and hammer (fig. 95).

(6) Apply a thin layer of rubber cement to the stem of the nose-cup and, while cement is wet, reinsert stem in outlet valve nozzle of facepiece. See that nose-cup is again properly alined in facepiece.

(7) Fold back nose-cup stem over outlet valve nozzle of facepiece so that it lies flat and smooth in position (fig. 96).

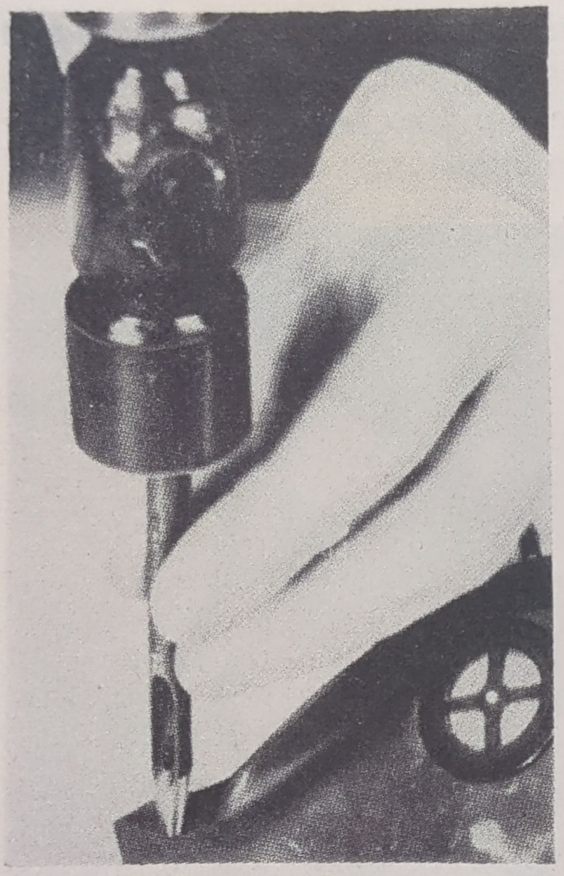


Figure 95. Cutting hole in nose-cup with punch.

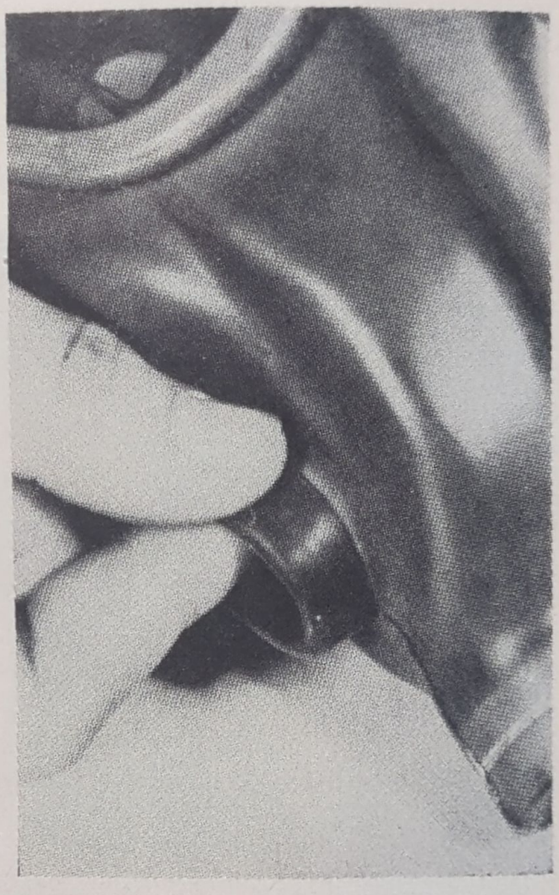


Figure 96. Folding stem of nose-cup over nozzle of facepiece.

(8) Install proper outlet valve as described in paragraph 98*a* or *b*.

(9) Install the cheek tab assemblies, replacing defective parts as described in paragraph 96*c* and making sure that the button fasteners are properly placed through the cut holes in the nose-cup cheeks.

c. REPLACEMENT OF VULCANIZED ATTACHMENT WITH RUBBER CEMENT.

(1) Release defective nose-cup where it is vulcanized to the inside cheek of the gas mask, cutting it free with a pair of shears.

(2) Remove outlet valve from outlet valve nozzle of facepiece as described in paragraph 98*a* or *b* depending on the type of outlet valve to be removed.

(3) Release the folded back nose-cup stem from the outlet valve nozzle of facepiece, permitting defective nose-cup to be removed from facepiece.

(4) Trim vulcanized attachments of the removed nose-cup from inside of facepiece cheek with a sharp knife or razor blade so that the inside cheek has a smooth surface. Take extreme care not to nick, damage, or weaken the structure of the facepiece.

(5) Apply a thin layer of rubber cement to stem of nose-cup and, while cement is wet, insert stem in outlet valve nozzle of the facepiece. Check alinement of nose-cup in facepiece.

(6) Fold back nose-cup stem over outlet valve nozzle so that it lies flat and smooth in position.

(7) Install proper outlet valve as described in paragraph 98*a* or *b*.

(8) Using solvent, clean the area around the vulcanized spots on the facepiece cheeks and on the corresponding spots on the nose-cup.

(9) Apply rubber cement on the cleaned spots and allow it to set for 15 minutes.

(10) Apply a second coat of rubber cement to the spots and allow it to set for 15 minutes.

(11) Press spots together and smooth with the fingers. Be sure that nose-cup is smoothly and properly alined in facepiece.

98. Outlet Valves

a. OUTLET VALVE M8. Outlet valve M8 is a component of facepiece assemblies M2A2, M3, M4, and M7.

(1) *Replacement of valve disk.*

(*a*) Unscrew plastic valve guard from the assembly (fig. 97).

(*b*) Remove defective rubber valve disk from the retaining stud (fig. 98).

(*c*) Place new rubber valve disk over the retaining stud. Be sure that disk is properly seated.

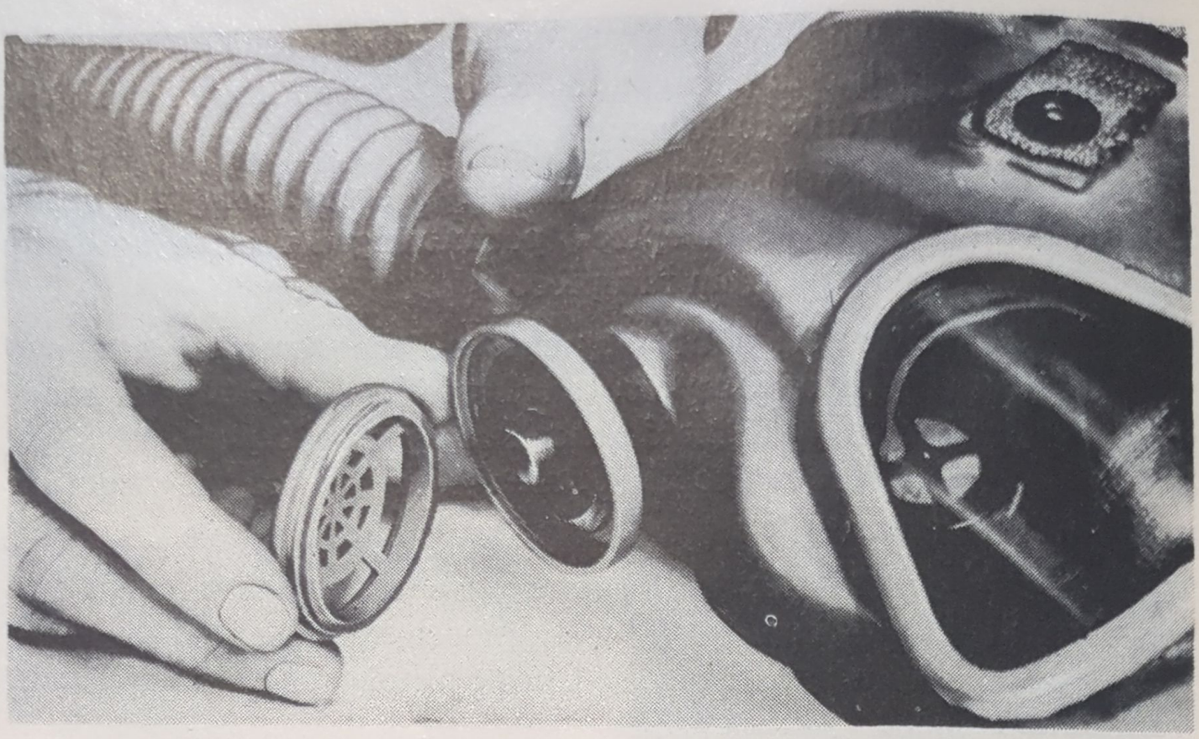


Figure 97. Removing guard from M8 outlet valve.

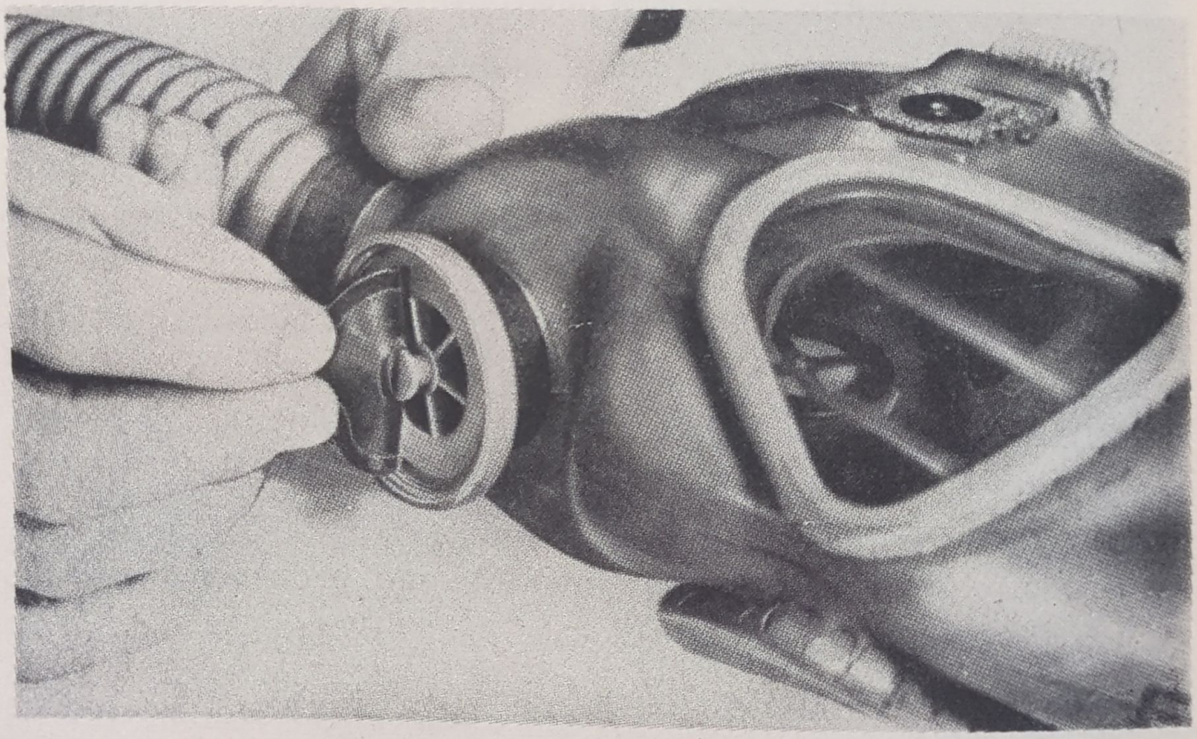


Figure 98. Removing disk from stud.

(*d*) Replace plastic valve guard by screwing it in position.

(*e*) Test mask manually for leakage as prescribed in FM 21–40.

(2) *Replacement of outlet valve assembly.*

(*a*) Remove the outer tape, wire clamp, and inner tape from around the valve stem.

(*b*) Remove defective valve assembly by carefully prying the outlet valve nozzle of the facepiece loose with a screw driver and removing the assembly (fig. 99).

Figure 99. Removing M8 outlet valve from nozzle of facepiece.

(*c*) Apply a thin coat of rubber cement to inside of outlet valve nozzle of facepiece and place a wire clamp over the projecting outlet valve nozzle.

(*d*) Insert M8 valve assembly in outlet valve nozzle of facepiece while rubber cement is wet.

(*e*) Apply tape, wire clamp, and tape as described in paragraphs 85-87.

(*f*) Test mask manually for leakage as prescribed in FM 21–40.

(3) *Removal of cemented M8 valve guard.*

(*a*) When valve guards have been cemented to the case by a spot of acetone, and the use of force is not sufficient to remove the guard, cut away a small portion of the case and guard with a penknife so that the spot of acetone is removed.

(*b*) Unscrew the guard or, if it will not release, break the grill front with pliers. Carefully break front of guard away from threaded case and remove the guard. Be sure the case threads are in good condition before screwing on a new valve guard.

b. OUTLET VALVE C15.

(1) *General.* Outlet valve C15 is a component of facepiece assemblies M2A3, M3A1, M4A1, M8, and C48R1.

(2) *Removal and replacement.*

(*a*) Disengage rubber cover from defective C15 outlet valve by stretching the parts underneath the ports and sides over the seat and then detaching the cover from the lug on top of the seat.

(*b*) Remove outer tape, wire clamp, and inner tape.

(*c*) Carefully loosen outlet valve nozzle of facepiece from around valve stem with a screw driver and remove defective outlet valve.

(*d*) Apply a thin coat of rubber cement to inside of outlet valve nozzle of facepiece.

(*e*) Remove rubber cover of new C15 outlet valve and, with the cement wet in the outlet valve nozzle, insert and aline the valve.

(*f*) Apply tape, wire clamp, and tape as described in paragraphs 85–87.

(*g*) Replace rubber cover over seat of outlet valve (fig. 100) by stretching the small hole at upper part of cover over the lug on the seat, and then stretching the under part and sides of cover over body of the seat.

Figure 100. Replacing rubber cover of C15 outlet valve.

99. Hose

a. REMOVAL.

(1) Detach defective hose from canister nozzle as described in paragraph 101*b* (2).

(2) Detach other end of hose from hose stem of facepiece in similar manner.

(3) Remove metal ferrule from end of hose which was inserted in the hose stem of the facepiece.

b. REPLACEMENT.

(1) Insert metal ferrule in new hose at end to be connected to facepiece (fig. 101).

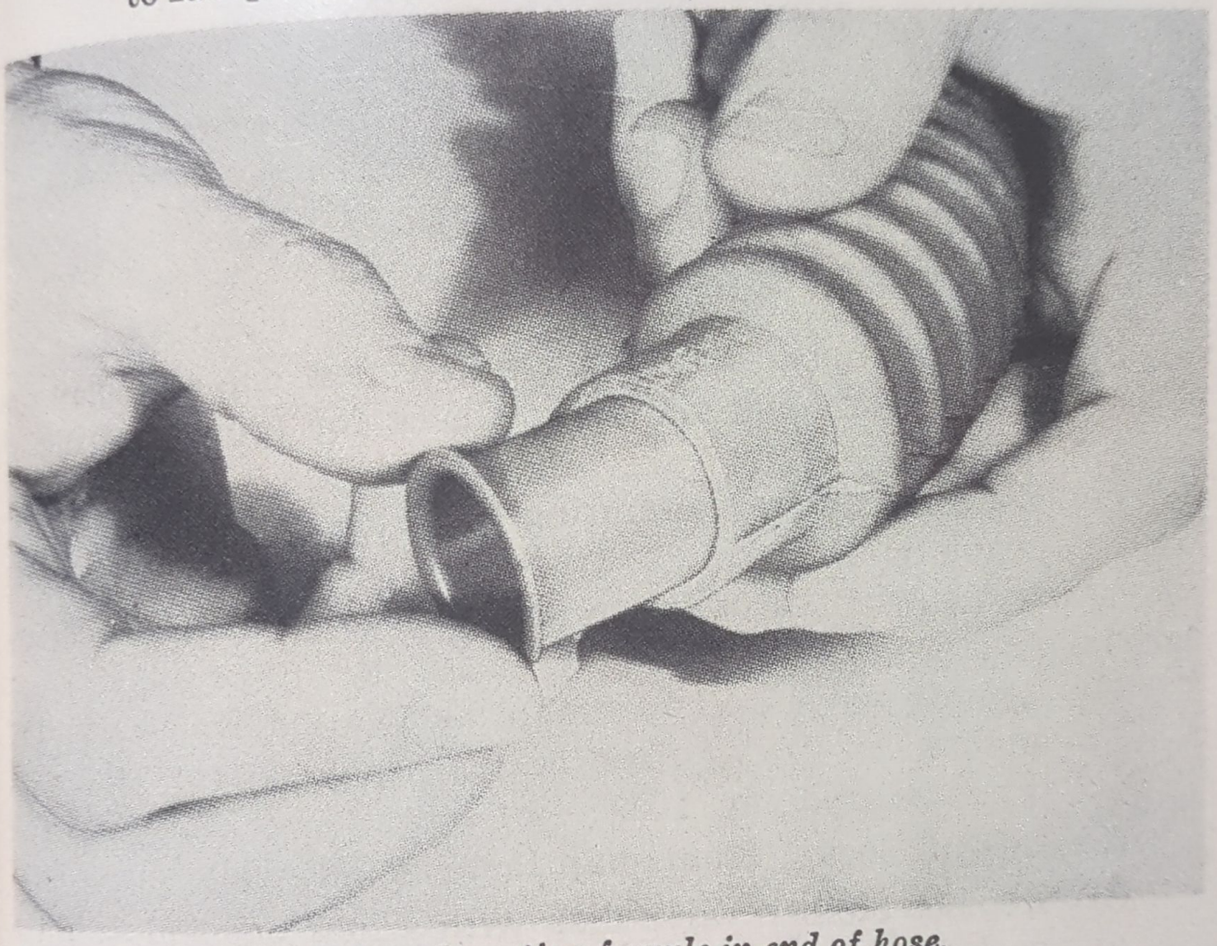


Figure 101. Inserting ferrule in end of hose.

(2) Apply a thin coat of rubber cement on outside of hose and, before it dries, insert hose and ferrule to within 3/8 inch of the first corrugation.

(3) Complete facepiece connection as described in paragraphs 85–87.

(4) Replace canister connection as described in paragraph 101*b* (3).

100. Inlet Valve Disks

a. INLET VALVE DISK OF CANISTER MOUNTING PIECE. To replace inlet valve disk—

(1) Remove canister mounting piece as described in paragraph 91*b*.

(2) Lift off socket from snap fastener assembly (fig. 102).

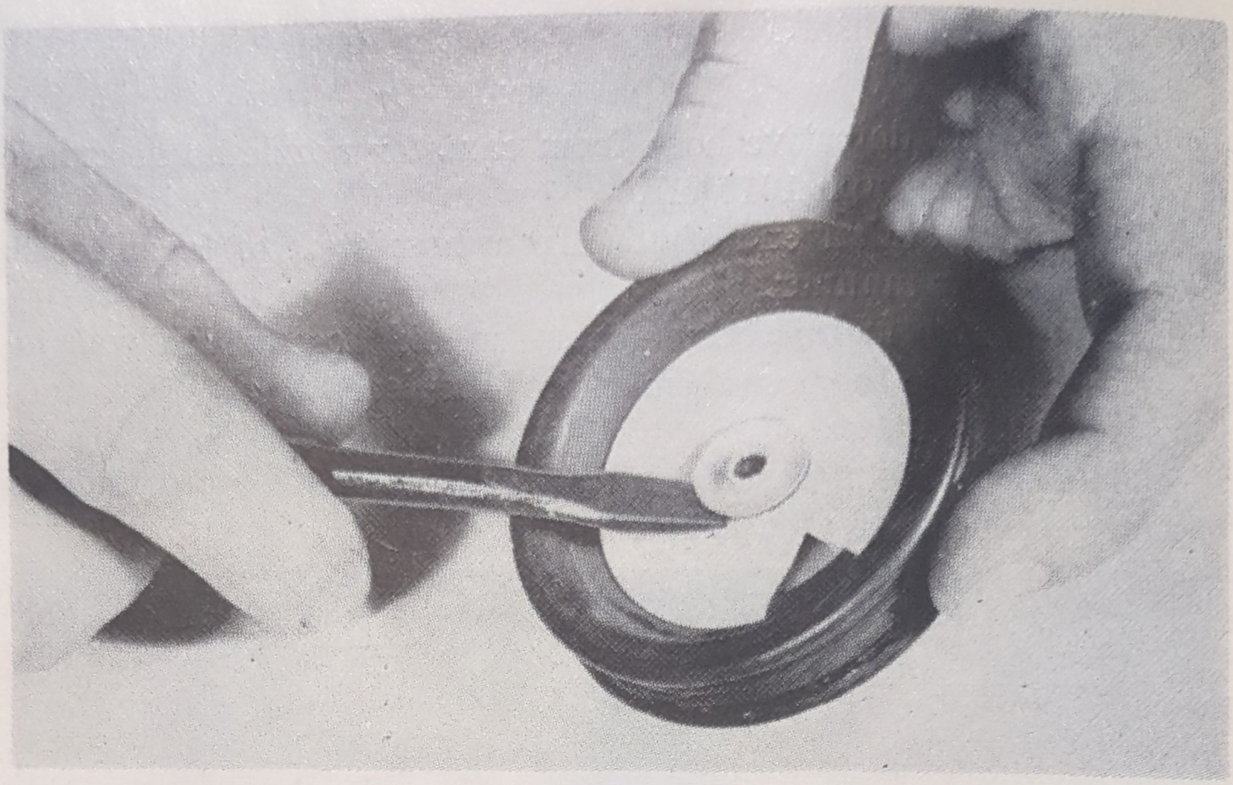


Figure 102. Lifting off socket.

(3) Replace rubber valve disk with a new one and snap the socket back over the disk. Check for proper seating of disk.

(4) Replace canister mounting piece as described in paragraph 91*c*.

b. INLET VALVE DISK OF CANISTER MOUNTING ADAPTER. To replace inlet valve disk:

(1) Remove valve seat assembly and gasket from mounting adapter by lifting them out carefully so that valve seat is not injured (fig. 103).

(2) Lift off socket from snap fastener assembly (fig. 104).

(3) Replace rubber valve disk with a new one and snap the socket back over the disk. Check for proper seat of the disk.

(4) Return the valve seat assembly to its original position in the adapter by pressing it down firmly with palm of hand.

(5) Replace rubber gasket at bottom of internally threaded section of adapter.

c. INLET VALVE DISK OF INLET VALVE SEAT ASSEMBLY IN CANISTERS.

(1) *General.* Inlet valve seat assemblies for canisters use a snap fastener method of fastening the rubber valve disk. Previously, the disk was fastened by means of a flanged stud. Removal and replacement for both methods are given below.

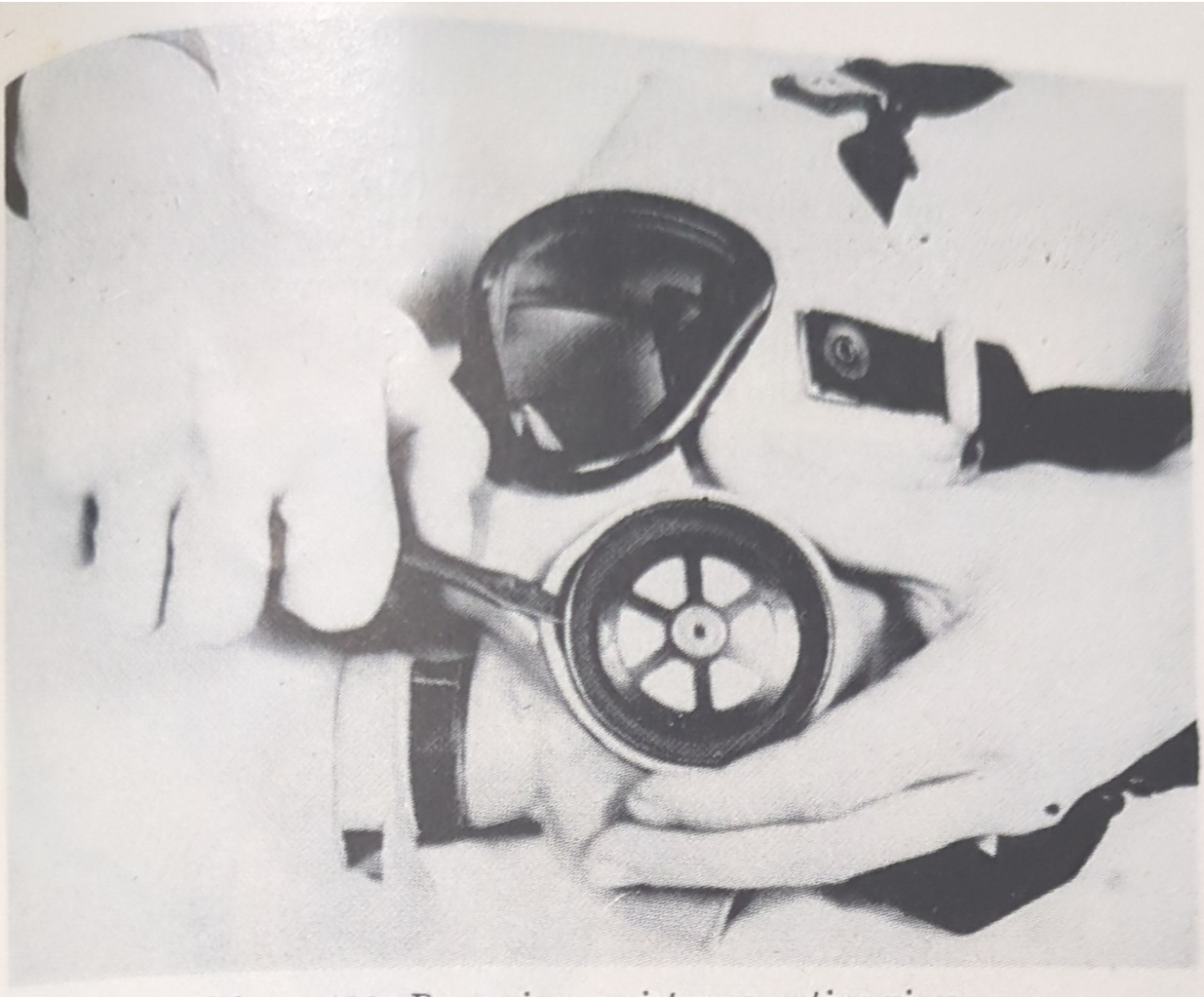


Figure 103. Removing canister mounting piece.

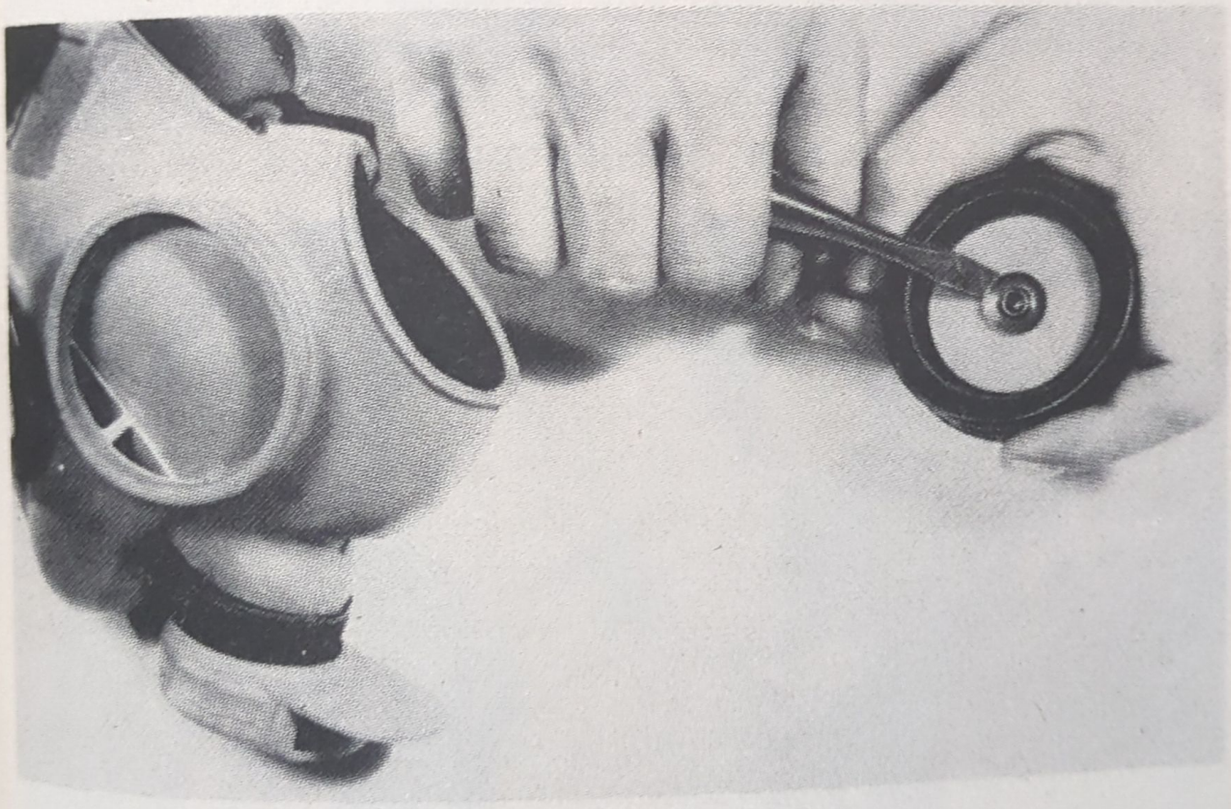


Figure 104. Lifting off socket.

(2) *Removal and replacement.*

(*a*) Remove inlet valve seat assembly by inserting a screw driver under the flange of the valve seat, prying it loose gently and equally so as not to cause a set or bend in the valve seat flange. Damage of this nature prevents an airtight seal.

(*b*) If the rubber valve disk fastening is the stud type, remove the defective rubber disk. Attach a new disk by pushing it gently over the stud so that the disk rests evenly against the valve seat (fig. 105). If the fastening is the snap fastener type, lift off socket from snap fastener assembly (fig. 106), remove and replace the defective rubber disk, and snap the socket back in place over the disk.

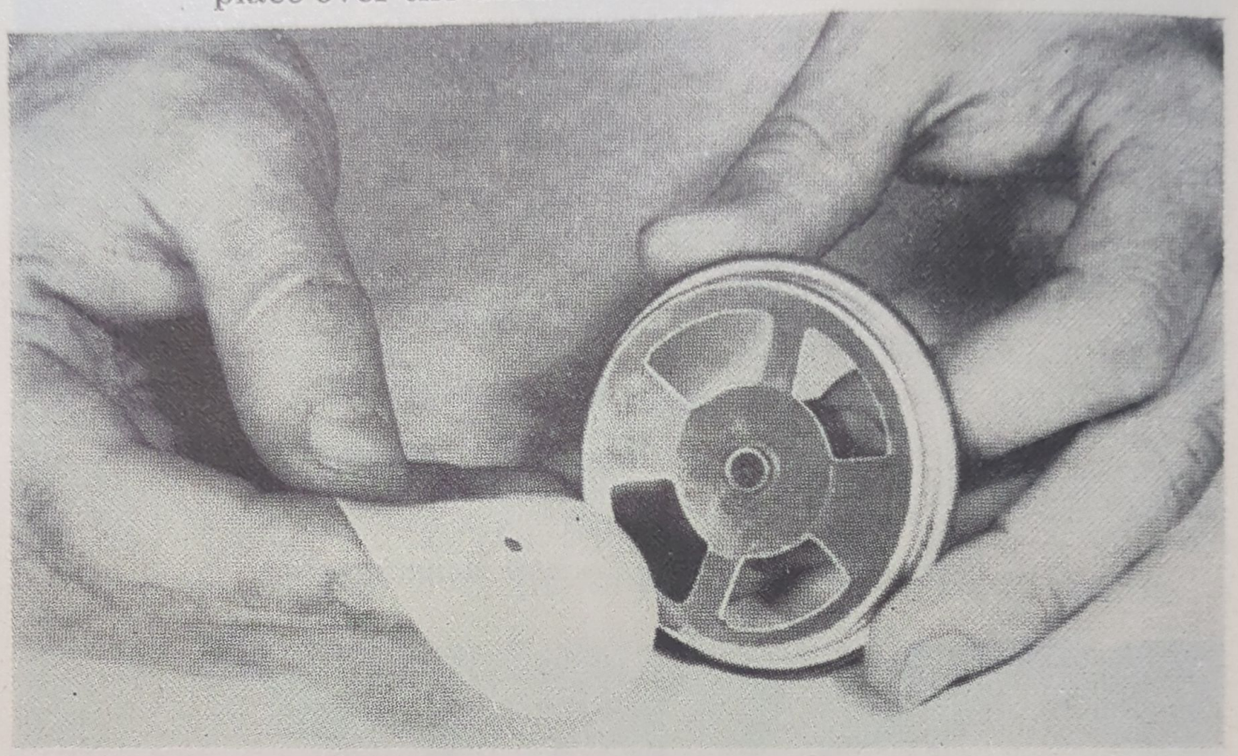


Figure 105. Replacing disk over stud.

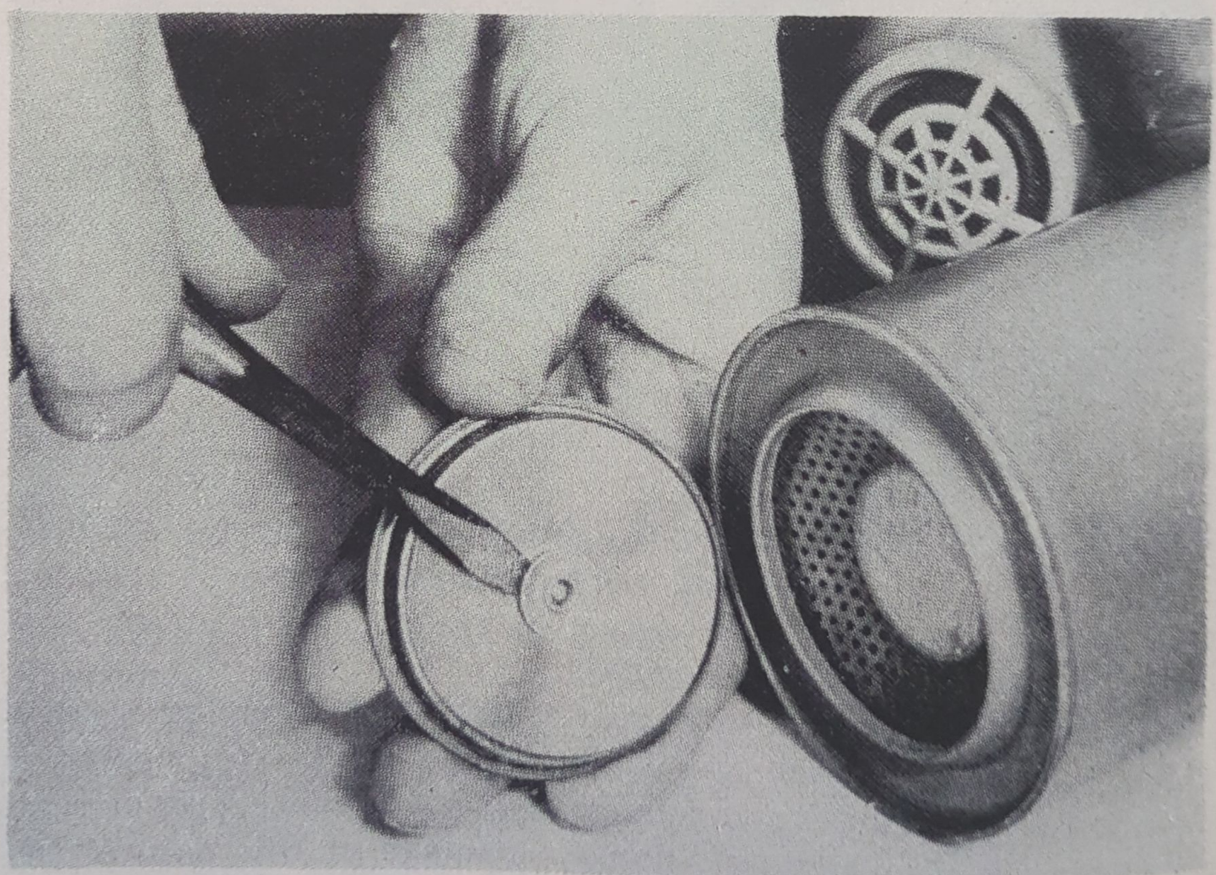


Figure 106. Lifting off socket.

(*c*) Insert valve assembly in canister, seat it squarely, and press it firmly in place with the heel of the hand.

(*d*) Test for leakage by fitting assembled mask to the face, closing the outlet valve by placing hand over it, and exhaling. Leakage can be felt at the air inlet.

101. Canisters

a. CANISTERS CONNECTED DIRECTLY TO FACEPIECE.

(1) *General.* Canister M11 is connected to the facepiece by means of a canister mounting piece in the M9 mask and headwound mask, and by means of a canister mounting adapter in the snout-type service mask. Canister may be replaced either when mask is being worn or when off the face. If mask is on face, hold breath, replace canister as indicated in (2) below, clear the mask, and test for leakage.

(2) *Replacement.*

(*a*) Remove closure cap from outlet opening of new canister.

(*b*) Screw new canister into canister mounting piece or mounting piece adapter. Be sure that it is screwed in tightly and is firmly seated.

(*c*) Test to insure gastight seal by placing palm of hand over air inlet and inhaling. This should collapse mask on face of wearer. If required seal is not obtained, locate the cause of the leakage and correct. Replace defective parts. Do not use mask until leakage is eliminated.

b. CANISTERS CONNECTED BY HOSE TO FACEPIECE.

(1) *General.* Canisters connected by hose to facepieces are used with all lightweight service masks, lightweight optical masks, and special masks.

(2) *Removal.*

(*a*) Remove outer layer of adhesive tape from hose where it is connected to the nozzle of the canister.

(*b*) Using pliers, remove wire clamp.

(*c*) Remove bottom layer of tape wrapped around hose.

(*d*) Carefully loosen hose from nozzle of canister by prying with a screw driver (fig. 107), and pull hose from canister nozzle.

(3) *Replacement.*

(*a*) Lubricate nozzle of canister with a thin coat of rubber cement (par. 88).

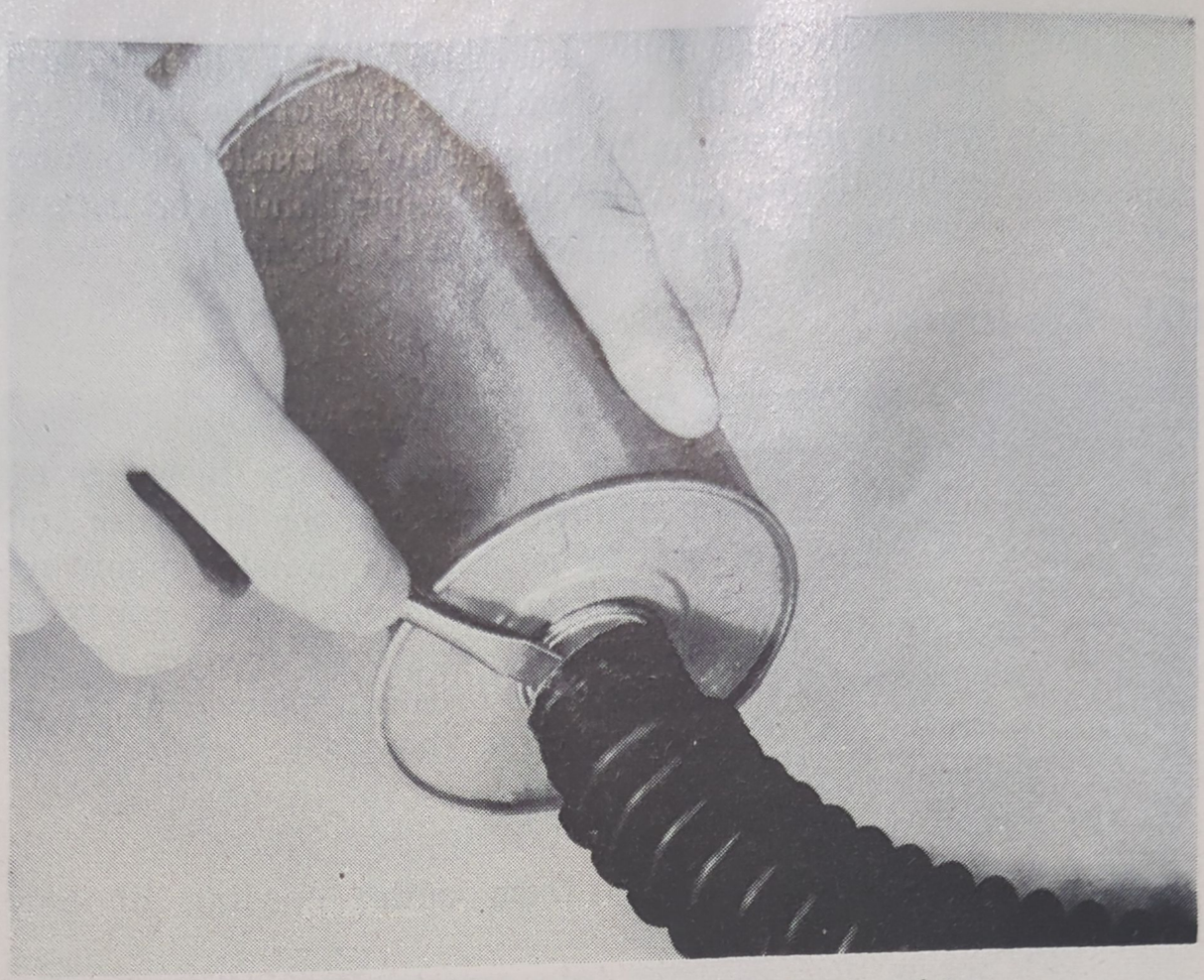


Figure 107. Loosening hose from nozzle of canister.

(*b*) Slide a clamp over the hose.

(*c*) Insert nozzle of the new canister into hose and aline canister and facepiece so that broad sides of rectangular canisters are parallel to sides of facepiece, with nozzle of canister extending upward (fig. 108). (Elbow nozzles of canisters should be inserted to the first corrugation on the hose. Nozzles on cylindrical canisters are slipped into the hose until hose contacts the top of the canister.)

(*d*) Place 1¼ turns of ½-inch tape around hose where it overlaps the canister nozzle.

(*e*) Tighten the wire clamp around the adhesive tape (par. 86).

(*f*) Cover wire with 1¼ turns of ½-inch adhesive tape overlapped at the joint of the wire clamp.

(*g*) Test mask manually for leakage as prescribed in FM 21–40.

102. Carriers

Emergency repairs to carriers may be made to the extent of sewing or improvising if materials for the repairs are in the M8

Figure 108. Alining gas mask with facepiece and canister in same plane.

tool set or are otherwise available. Permanent repairs are made only by maintenance units. If carrier is damaged beyond repair, replace with a new carrier.

APPENDIX I

DOG GAS MASK

Note. For information on horse gas masks, see TM 3–230.

1. General

a. The dog gas mask M6–12–8 (fig. 109) is provided for each dog used for tactical purposes by the Armed Forces in theaters of operations. The mask consists of three major components: the muzzlepiece assembly, canister, and carrier.

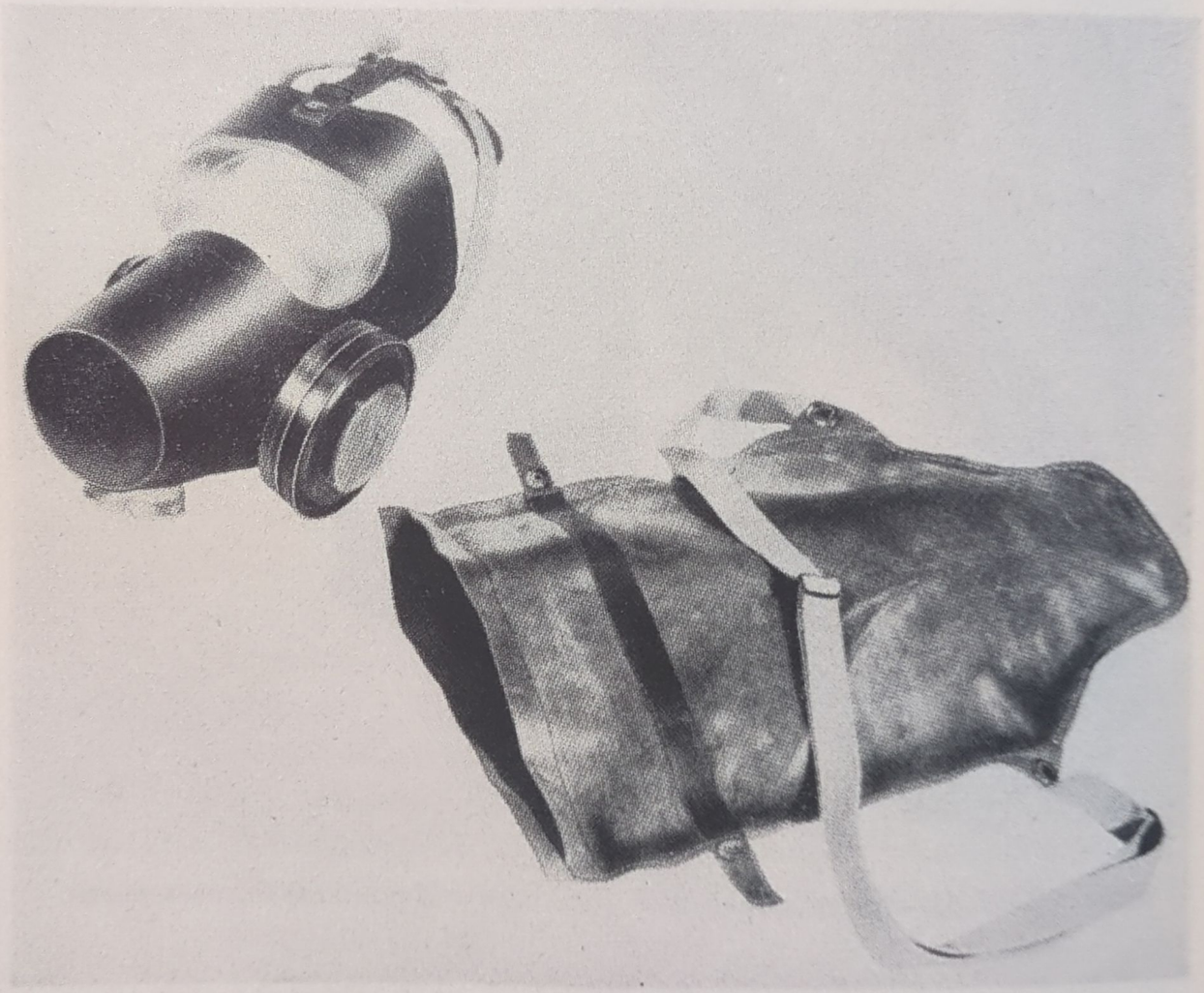


Figure 109. Dog gas mask M6–12–8.

b. The handler carries the mask for his own dog in any convenient manner, according to his own equipment. In general, the dog mask should be adjusted on the dog whenever a mask is required by man. Tear gases, vomiting gases, and vapors of blister gases, however, are not as harmful to the dog as they are to man.

c. When the dog is exposed to areas contaminated with blister gases, the handler should adjust the dog gas mask on the dog. Blister gas vapors do not ordinarily significantly affect the dog's

skin. The dog should be carried by his handler, however, over areas in which liquid blister gas could be transferred to his skin, or he should be given some form of body protection. Protective ointment M5, supplied in the dog mask carrier, provides considerable protection against exposure to liquid-contaminated terrain if applied to the feet and lower legs of the dog.

2. Muzzlepiece Assembly M6
(fig. 110)

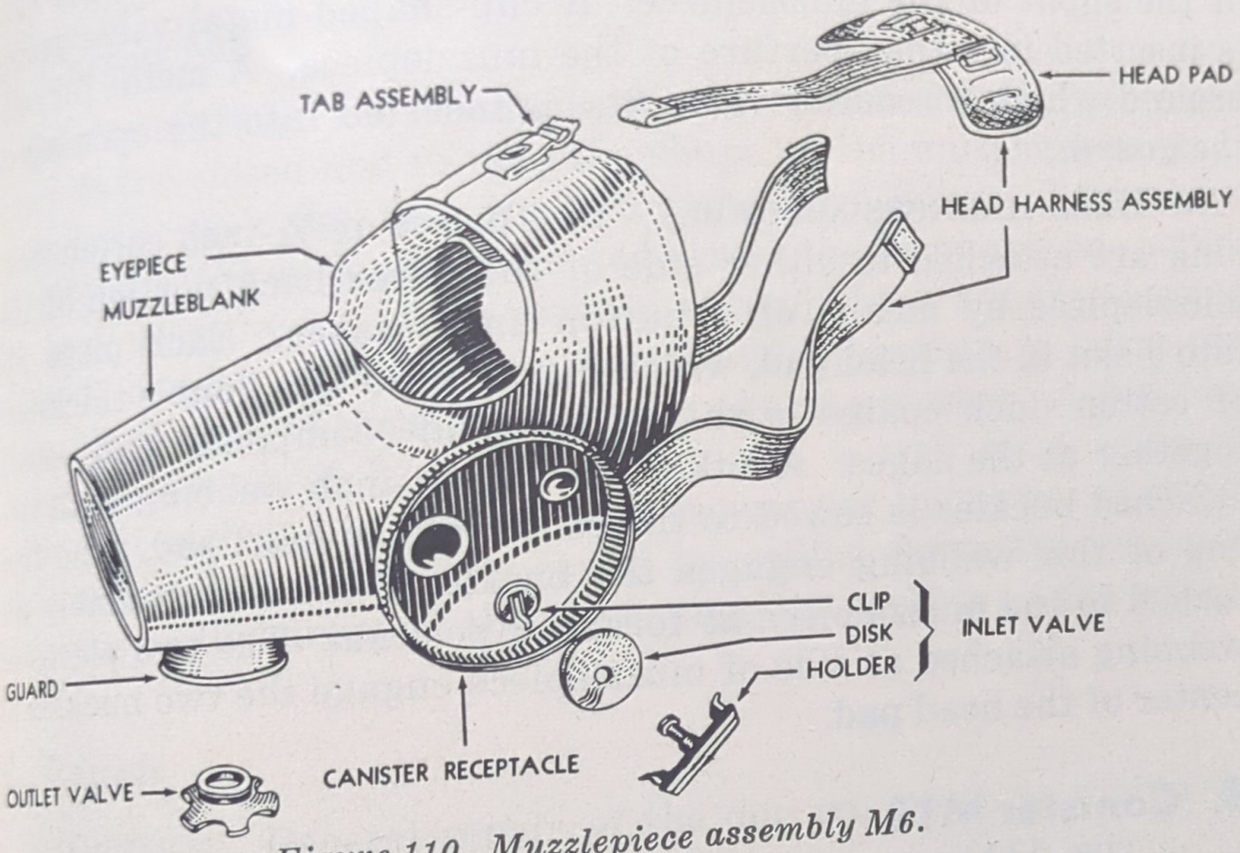


Figure 110. Muzzlepiece assembly M6.

a. MUZZLEBLANK. The muzzleblank, made of rubber-coated fabric, is manufactured in one size only.

b. INNER AND OUTER DAMS. An inner dam of synthetic rubber is stitched and cemented across the snout and in front of the eyepiece. An outer dam of synthetic rubber is sewed and cemented around the open end of the muzzlepiece. Dam is pliable and shaped to fit snugly around the dog's head, effecting a gastight seal.

c. EYEPIECE. A single molded cellulose acetate lens is inserted in the eyepiece aperture and cemented into position.

d. CANISTER RECEPTACLES. Metal canister receptacles are provided on each side of the muzzlepiece. Each is fastened to the muzzlepiece by means of a button and washer and by a 7/8-inch grommet crimped to the muzzlepiece and receptacle. The receptacles are threaded internally to receive the canisters.

e. INLET VALVES. In each canister receptacle is an inlet valve, composed of a plastic holder, a rubber disk, and a metal clip. The

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holder is shaped to seat itself in the grommet opening. The disk fits over the stud of the holder and is held in place by the clip. This valve permits pure air to be drawn into the mask but prevents exhaled air from passing back through the canister.

f. FOREHEAD TAB ASSEMBLY. A tab assembly, to which the head harness is fastened, is attached to the muzzleblank at forehead position by means of a button and washer. This assembly consists of ¾-inch cotton webbing and a buckle.

g. OUTLET VALVE. The outlet valve is located on the under side of the snout of the muzzlepiece. A cup-shaped metal valve guard is inserted into the aperture of the muzzlepiece. A metal ferrule, around which the outlet valve fits, is inserted into the opening of the guard.

h. HEAD HARNESS ASSEMBLY. Two pieces of ¾-inch cotton webbing are attached to either side of the lower back portion of the muzzlepiece by means of a button and washer. Each piece fits into a slot in the head pad, which is composed of a double thickness of cotton duck coated with vinyl-chloride compound and sewed together at the edges. Another piece of ¾-inch webbing with two attached buckles is sewed to the center of the head pad. The free end of this webbing engages the buckle of the tab assembly attached to the muzzlepiece at forehead position. The two pieces of webbing attached at side of muzzlepiece engage the two buckles at center of the head pad.

3. Canister M12
(fig. 111)

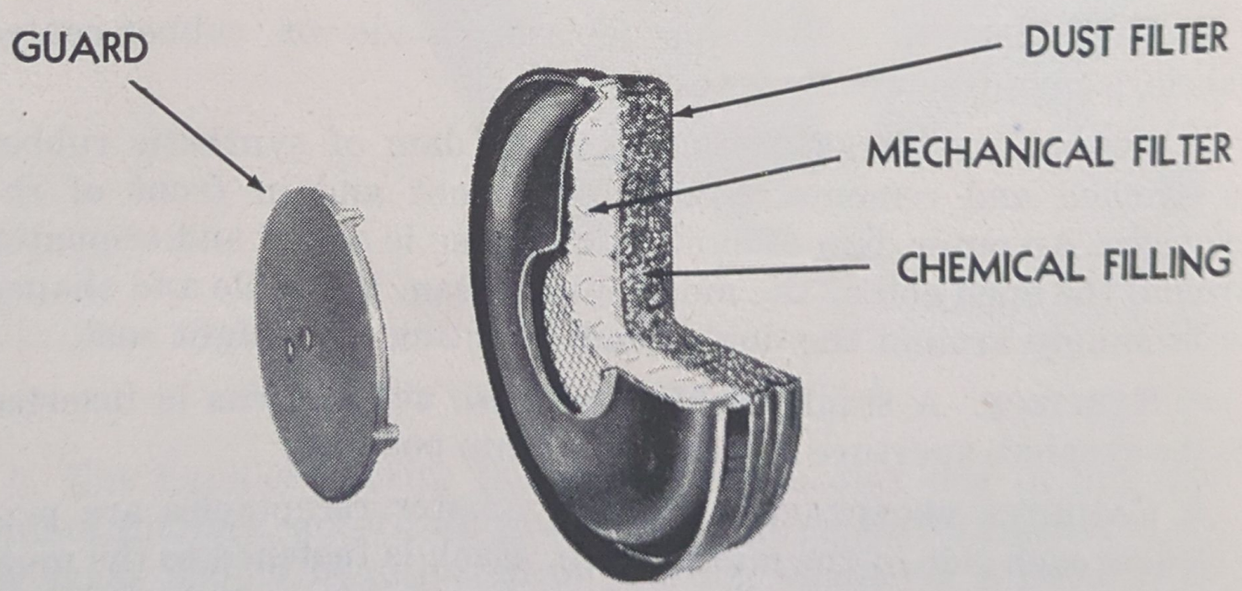

Figure 111. Canister M12.

a. GENERAL. Two canisters screw into the canister receptacles, one on each side of the muzzlepiece. A rubber gasket helps to effect a gastight seal. On one side of the canister is a perforated

metal disk which holds the chemical filling in place. On the other side is a circular air inlet opening protected by a metal guard.

b. MECHANICAL FILTER AND CHEMICAL FILLING. Air enters the canister through the circular opening on body of canister and flows through the felt pad mechanical filter. Air then flows through the chemical filling [activated (type ASC impregnated) charcoal], through a dust filtering felt disk, through the perforated metal end of the body into the inlet valve of the muzzlepiece.

4. Carrier M8

Carrier M8 (fig. 109) is made of waterproofed duck, narrowed down at the closed end to take the shape of the muzzlepiece. It is extended at each side near the bottom to form wings. Two straps of waterproofed duck, one cemented across the front and one across the back near the top of the carrier, extend about 2 inches beyond sides of carrier where they are cemented together to form one strap. Both ends of the strap have a stud and a washer. A shoulder strap, consisting of ¾-inch webbing and a web strap slide, is secured at each end to the wings of the carrier by means of clinch plate and socket. Carrier is closed by rolling down the top until the studs on the straps at the top engage the sockets on the wings.

5. Repair

a. GENERAL. General repair of the dog gas mask is similar to repair of human gas masks.

b. REPLACING INLET VALVE DISK OF CANISTER RECEPTACLE.

(1) Remove canister by unscrewing it from canister mounting piece.

(2) Pull out valve assembly from inlet opening (fig. 112).

(3) Remove retaining clip which holds disk in place.

(4) Remove defective disk and replace with a new disk (fig. 113).

(5) Replace clip which holds valve disk in place.

(6) Replace inlet valve assembly in inlet opening and check to see if disk seats properly.

c. REPLACING CANISTER M12.

(1) Apply glycerine, soapy water, or plain water, to gasket of new canister and place it in the canister receptacle.

(2) To insure a tight seal, screw canister down tightly with hand against gasket in canister receptacle.

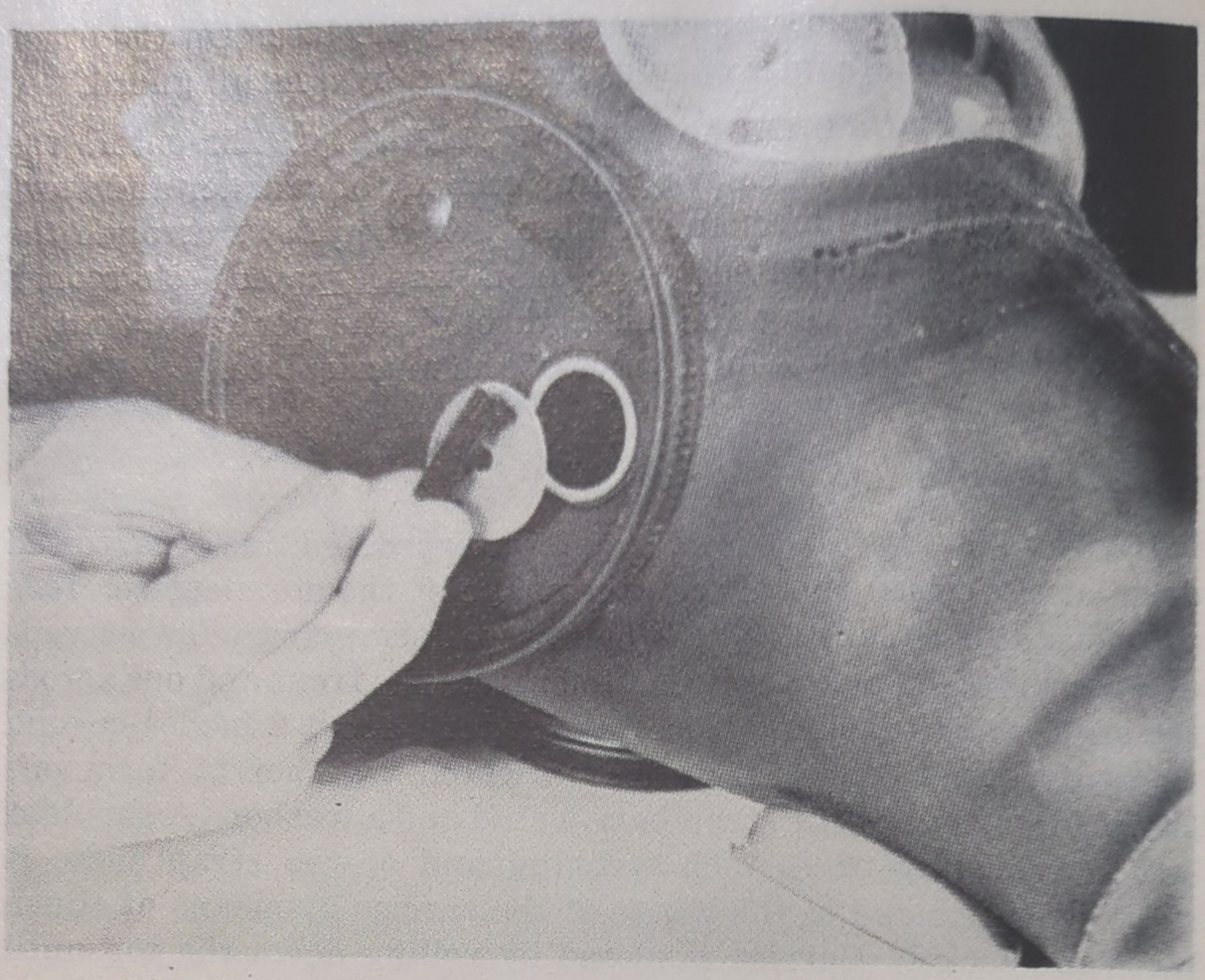

Figure 112. Removing inlet valve assembly from inlet opening.

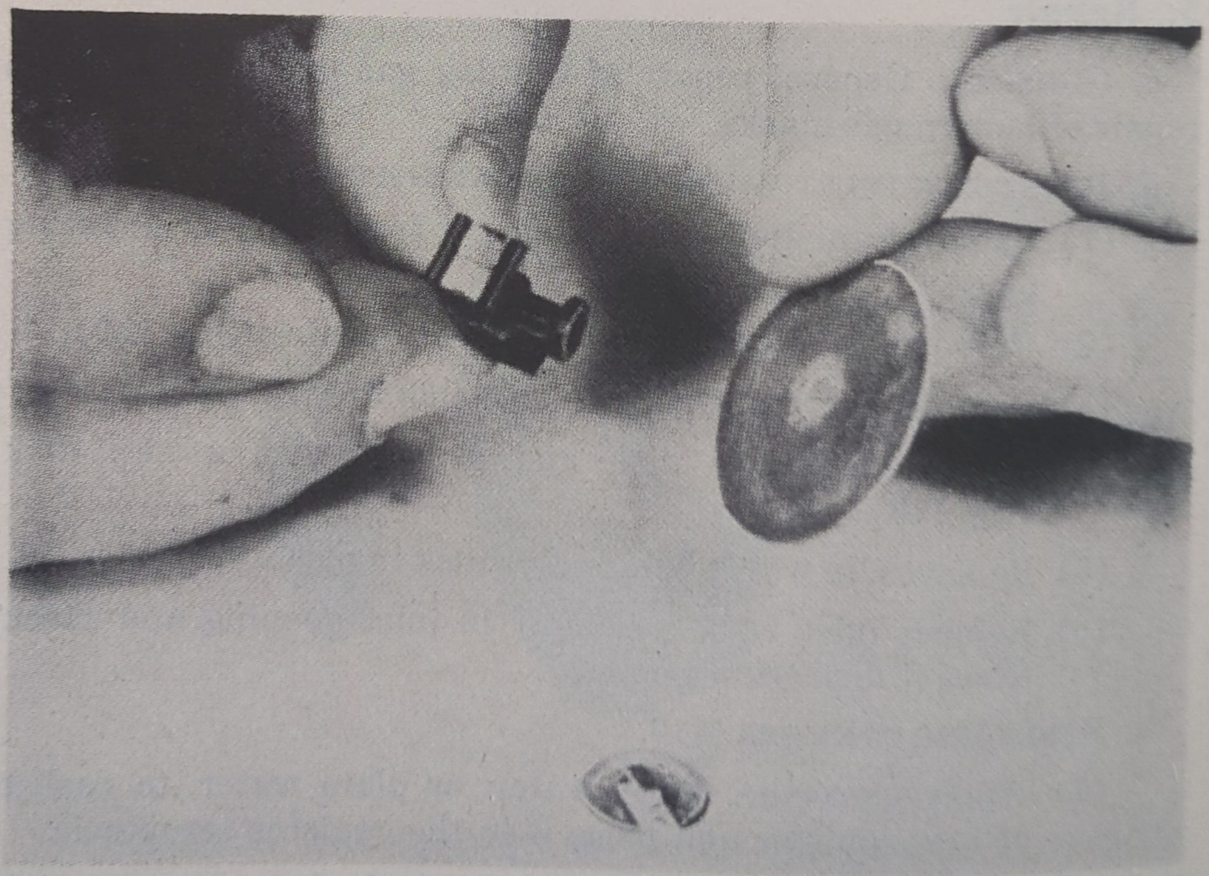

Figure 113. Replacing defective disk.

6. Care and Preservation

The dog gas mask is sufficiently rugged in construction to withstand ordinary use. Its life is considerably shortened, however, by improper handling and lack of care. The following precautions should be taken:

a. Do not allow interior of canister to become wet. A wet canister gives high resistance to breathing and does not provide proper protection. New canisters are supplied in hermetically sealed cans in which they should be allowed to remain until ready for use. The mask should be kept in the waterproof carrier except when in use.

b. To prevent leakage when replacing canister, use glycerine, soapy water, or clear water on the gaskets.

c. Examine outlet valve occasionally during use, and remove any small sticks or particles which may lodge in it.

d. Wipe saliva out of the mask after each use. If facilities are available, wash muzzlepiece with water. Always remove canisters before washing muzzlepiece. Wipe plastic eyepiece with soft paper or cloth, being careful not to scratch eyepiece with grit or sand. Dry muzzlepiece in shade. Attach canisters before replacing mask in carrier.

7. Effects of Temperature

The dog is uncomfortable when wearing a gas mask in hot weather because the mask interferes with natural elimination of body heat from his respiratory organs. Periods which the dog may wear a mask and the type of exertion to be expected of him at various temperatures are indicated below:

Temperature	*Time*	*Exertion*
Under 75° F.	Extended	Moderate
75° to 85° F.	25 minutes	Mild
85° to 100° F.	25 minutes	None

8. Training Dog to Wear Mask

Train the dog until he ceases to resist the wearing of the mask. Increase periods of training from 5 minutes to 30 minutes. When the dog is accustomed to mask, give review training periods of 10 to 15 minutes at infrequent intervals. During the review training, handler adjusts his mask before adjusting his dog's mask.

9. Adjusting the Mask

To adjust the dog mask, proceed as follows:

a. Place dog in the "sit" position. Hold dog's leash with left hand 2 or 3 inches from dog's neck.

b. Hold mask in right hand, directing dog's head downward.

c. Place mask on dog, holding it in place until dog stops resisting.

d. Continuing to hold mask in place with right hand, tighten head harness straps until proper fit is obtained. If an untrained dog offers undue resistance, an assistant should stand astride and hold the dog while mask is adjusted.

e. When mask is adjusted, give the command: HEEL.

f. If dog attempts to remove mask, push his paws away from the mask. Give the correction: NO.

APPENDIX II

PACKING AND PACKAGING

1. All gas masks are packaged as separate units and packed in wood boxes for storage and shipment (see table II). Replacement canisters and some special purpose canisters are packed and shipped in wood cases.

Table II. Packing
(Complete assembly)

Gas mask assemblies	Unit packaging	Units per wood box*	Approx. weight (pounds)	Displacement (cubic feet)
Lightweight service gas mask M3–10A1–6	fiberboard box or metal container	6	55	3.2
Lightweight service gas mask M3A1–10A1–6	fiberboard box or metal container	6	55	3.2
Lightweight service gas mask M4–10A1–6	fiberboard box or metal container	6	55	3.2
Lightweight service gas mask M4A1–10A1–6	fiberboard box or metal container	6	55	3.2
Lightweight optical gas mask M2–10A1–6	fiberboard box or metal container	6	50	3.2
Gas mask M9	metal container	6	55	3.2
Snout-type service gas mask M8–11–10	fiberboard box or metal container	6	50	2.5 — 3.1
Headwound gas mask M7–11–9	fiberboard box	20	50	3.1
Special gas mask M2A2-acid vapor MI–IIIA1	fiberboard box	6	50	3.5
Special gas mask M2A2-all-purpose MI–IIIA1	fiberboard box	6	50	3.5
Special gas mask M2A3-all-purpose MI–IIIA1	fiberboard box	6	50	3.5
Special gas mask M2A2-ammonia M2–IVA1	fiberboard box	6	50	3.5
Special gas mask M2A2-HCN M2–IVA1	fiberboard box	6	50	3.5
Special gas mask M2A2-oil vapor MI–IIIA1	fiberboard box	6	50	3.5
Special gas mask M2A3-oil vapor MI–IIIA1	fiberboard box	6	50	3.5

* Some may be packed 10 to a case.

2. The M9 gas mask is packaged as a unit in a hermetically sealed can (fig. 114) with all components ready for issue. The canister is sealed in a smaller can.

Figure 114. Packaging for M9 mask.

APPENDIX III

REFERENCES

1. Technical Manuals

TM 3–220	Decontamination
TM 3–230	The Horse Gas Mask, M4 and M5
TM 3–290	Miscellaneous Gas Protective Equipment

2. Field Manual

FM 21–40	Defense Against Chemical Attack

3. Technical Bulletins

TB 3–205–16	Indicator, Eyepiece Leakage, E5
TB 3–205–17	Indicator, Canister Resistance, E8R4

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